Carrier
TRANSICOLD

# OPERATION AND SERVICE MANUAL

## BUS AIR CONDITIONING UNIT

## Capri–180
## Capri–280 Advantage
## and Advantage Wide

T–245–01

# OPERATION AND SERVICE MANUAL

## BUS AIR CONDITIONING UNIT

## MODELS
## CAPRI–180 Advantage
## CAPRI–280 Advantage
## CAPRI–280 Advantage Wide

Carrier Transicold Division, Carrier Corporation, P.O. Box 4805, Syracuse, N.Y. 13221

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# SECTION 1

# DESCRIPTION

## 1.1 INTRODUCTION

This manual contains Operating Data, Electrical Information and Service Instructions for Capri models, 180, 280–Advantage (A) and 280–Advantage Wide (AW) Bus Air Conditioning systems. Refer to the model chart in Table 1–1.

The Capri–180 & 280 units are separate roof mounted condenser and evaporator assemblies connected by tubing and hoses (Refer to Figure 1–1 & 1–2). The system is connected to a compressor(s) driven by the bus engine. The Capri–180 which uses R–12 refrigerant is designed for buses 21 to 40 ft. long. The Capri–280 which uses R–22 refrigerant is designed for buses 40 to 60 ft. long.

The Capri–280 Advantage and the Capri–280 Advantage Wide units are similar in component configuration and operation. Both units use the Carrier 05G Bus compressor. The primary difference between the models is the unit width. The Advantage Wide is approximately 25 inches wider (than the Advantage) for special applications.

Unlike the 280 models, the 180 has dual refrigerant systems which operate independent of each other with Sankyo compressors.

The condenser assembly consists of two condenser coils, four condenser fan motor assemblies, receiver and filter–drier.

The evaporator assembly consists of two evaporator coils, moisture indicator(s) (sight glass), thermostatic expansion valves, electrical control panel and six evaporator fan motors (280 models) or four evaporator fan motor assemblies (180 models).

Most units have a 24 vdc relay control board initiated by a dash mounted switch, though some special applications are 12 vdc. The operation of the unit is controlled by an automatic temperature controller and sensor located on the control panel in the evaporator section. The controller has a set point which is pre–set at 65 ¦ 3)F (18)C). To maintain the pre–set temperature, the controller will cycle the compressor clutch (on and off) to control the operation of the system.

Table 1–2 below shows additional supprot manuals available for the Capri units.

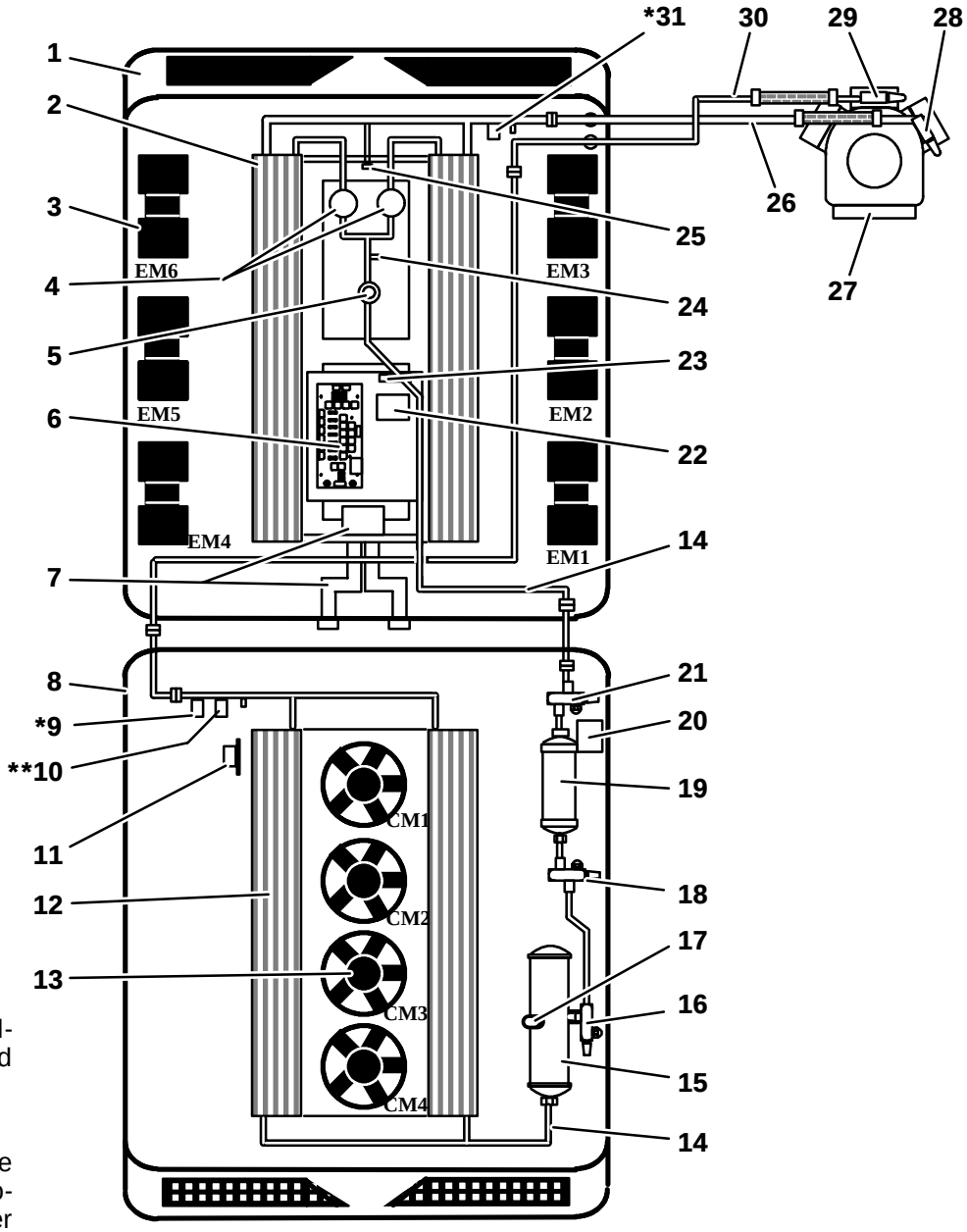
Installation guidelines for Capri units may be obtained by writing to the attention of: Transport Air Conditioning Group, Carrier Transicold, P.O. Box 4805, Syracuse, NY 13221.

**Table 1–1. Model Chart**

| MODELS | SERIES | DESCRIPTION | COMPRESSOR | REFRIGERANT |
|---|---|---|---|---|
| Capri–180–A | Advantage | Dual system unit for medium size buses 21 – 40 ft. | Sankyo (each system) | R–12 |
| Capri–280–A | Advantage | Standard unit for buses 40 – 60 ft. Unit 51.20 inches wide | 05G | R–22 |
| Capri–280–AW | Advantage Wide 68RT280–104–1 | For buses 40 – 60 ft. with compressors mounted on left side. Unit 75.86 inches wide. | 05G | R–22 |
| | Advantage Wide 68RT280–104–2 | For buses 40 – 60 ft. with compressors mounted on right side. Unit 75.86 inches wide. | 05G | R–22 |

**Table 1–2. Additional Support Manuals**

| MANUAL/ FORM NO. | EQUIPMENT COVERED | TYPE OF MANUAL |
|---|---|---|
| T–199 | 05G Bus Compressor | Operation and Service |
| T–200 | 05G Bus Compressor | Parts List |
| T243/245PL | Capri–180/280 | Parts List |



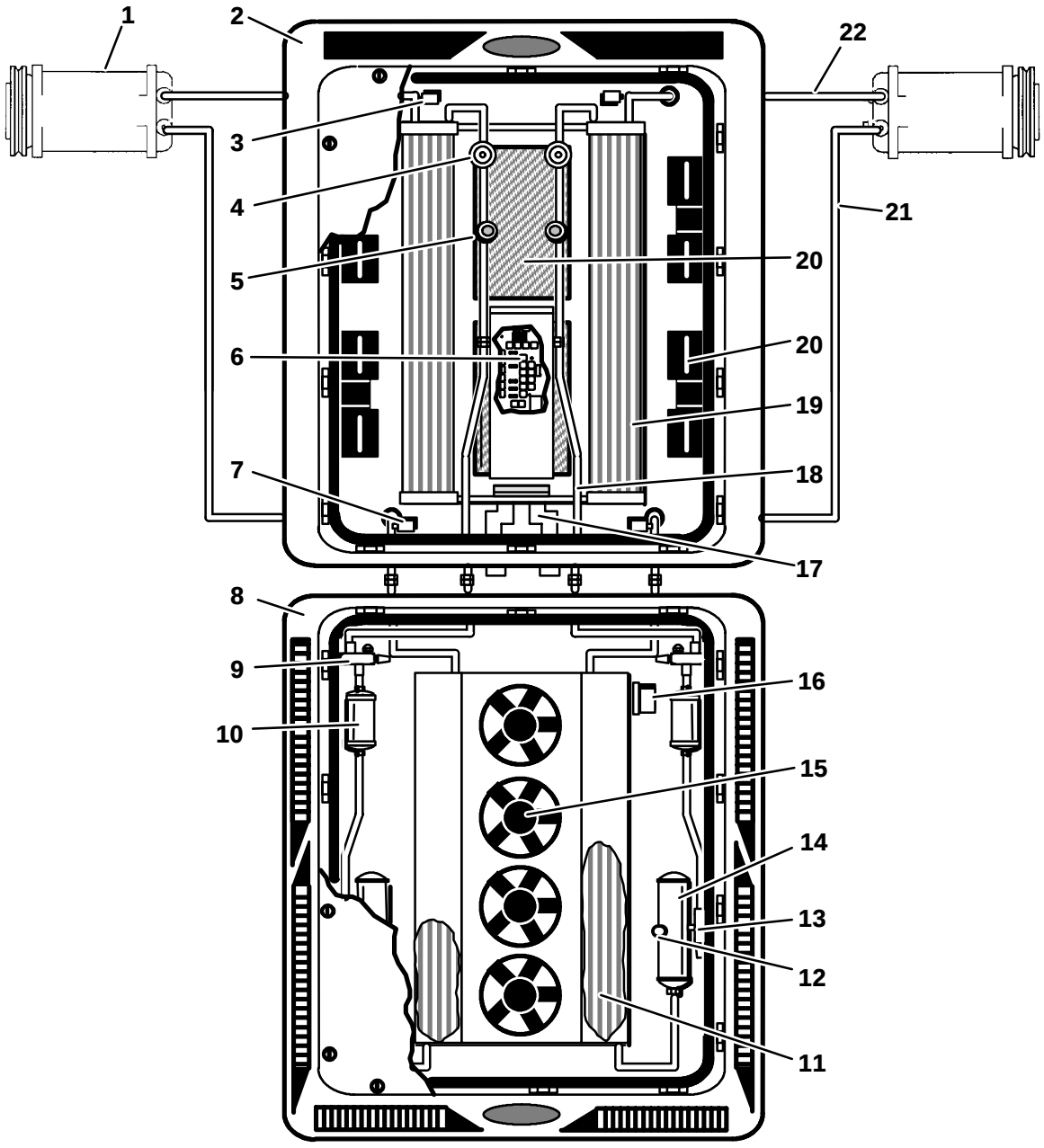

**ADVANTAGE WIDE UNIT SHOWN**

***On the Advantage model this switch is located on the compressor.**

****On the Advantage model, this switch is located on the filter–drier valve.**

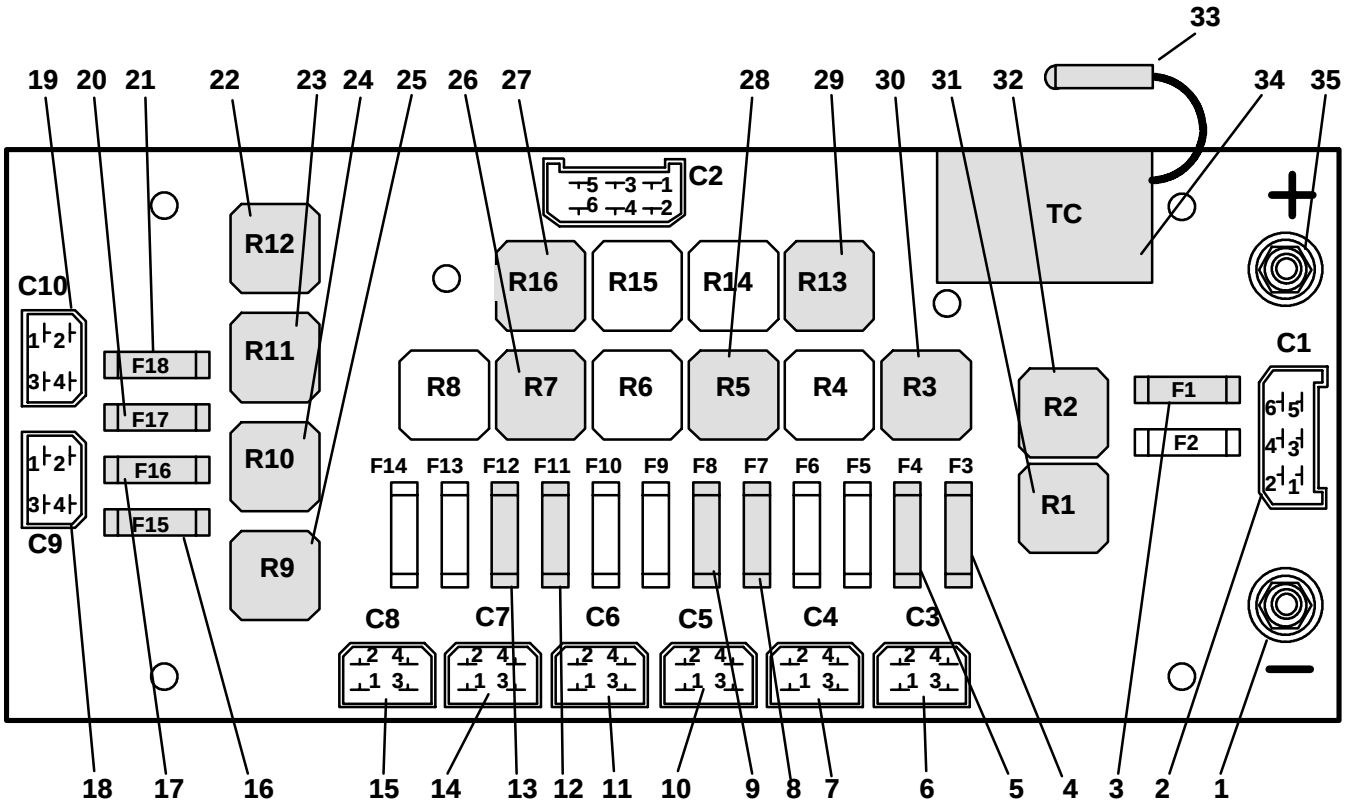
1. Evaporator Section
2. Evaporator Coil
3. Evaporator Blower
4. Expansion Valves (TXV)
5. Moisture Indicator Sight Glass
6. Control Board
7. Air Make–Up System
8. Condenser Section
9. High Pressure Safety Switch
10. High Pressure Unloader Control Switch
11. Ambient Air Switch
12. Condenser Coil
13. Condenser Fan Motors
14. Liquid Line
15. Receiver
16. Receiver Valve
17. Receiver Pressure Relief Valve
18. Filter–Drier Inlet Service Valve (AW Only)
19. Filter–Drier
20. Condenser Model/Serial Number Plate
21. Filter–Drier Outlet Service Valve
22. Evaporator Model/Serial Number Plate
23. System Specifications Plate
24. High Side Service Port
25. Low Side Service Port
26. Suction Line
27. Compressor
28. Suction Service Valve
29. Discharge Service Valve
30. Discharge Line
31. Low Pressure Safety Switch

**Figure 1–1. Capri–280 Component Identification**




1. Sankyo Compressor (SD510−HD)
2. Evaporator Section
3. Low Pressure Safety Switch
4. Expansion Valves (TXV)
5. Moisture Indicator Sight Glass
6. Control Board
7. High Pressure Safety Switch
8. Condenser Section
9. Liquid Line Shut−Off Valve
10. Filter−Drier
11. Condenser Coil
12. Receiver Pressure Relief Valve
13. Receiver Valve
14. Receiver
15. Condenser Fan Motors
16. Ambient Air Switch
17. Air Make−Up System
18. Liquid Line
19. Evaporator Coil
20. Evaporator Blower
21. Suction Line
22. Discharge Line

**Figure 1−2. Capri−180 Component Identification**



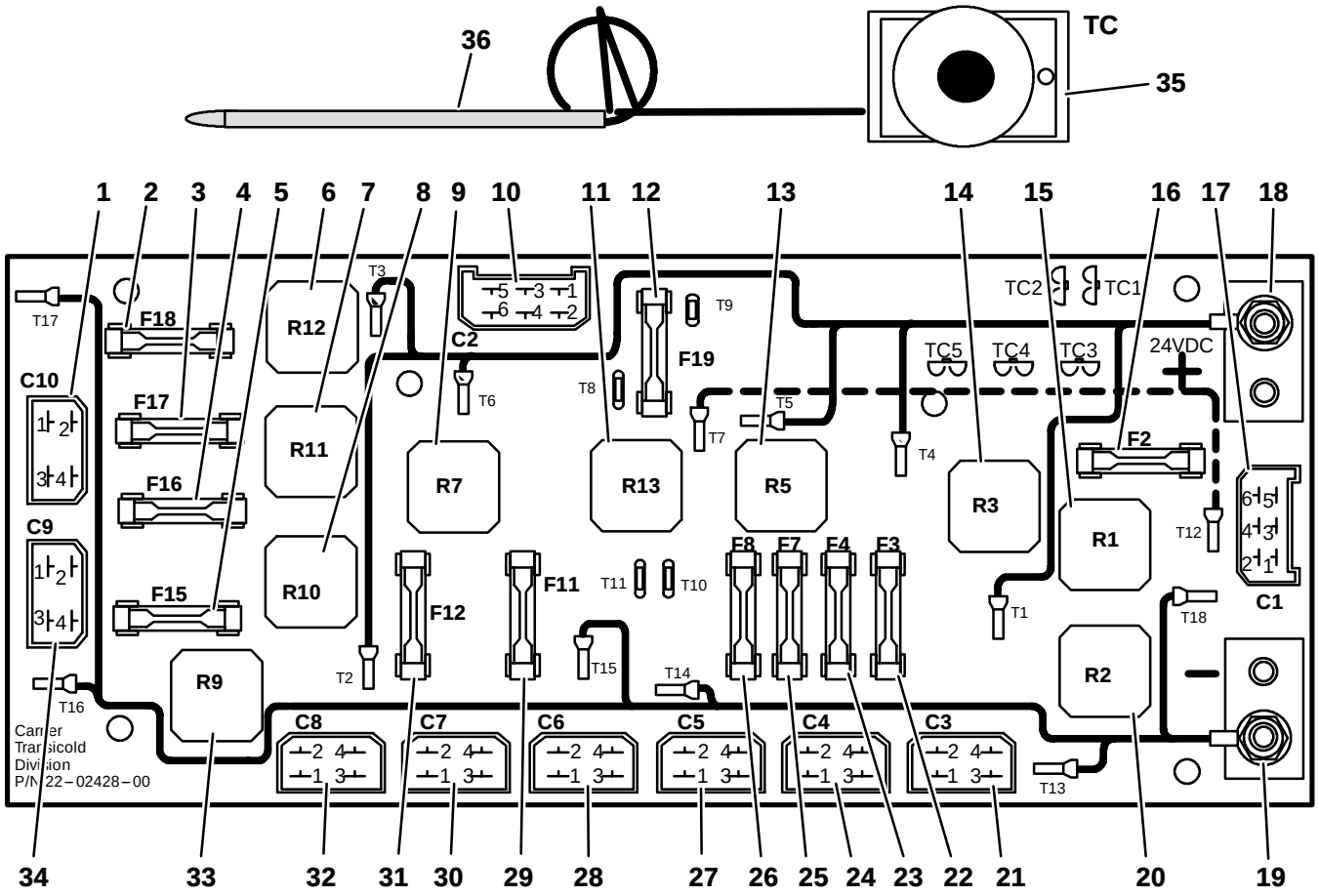

## BLACK BOARD

**NOTES:** 1. The following components are spares: R4, R6, R8, R14, R15; F2 (if on control board), F5, F6, F9, F10, F13, & F14.

2. The Fault Relay (FR) used in the Advantage model only, is mounted next to the relay control board.

1. Negative Cable Lug
2. Compressor Clutch Coil, Unloader and Unloader Control Switch Receptacle
3. Compressor Clutch Coil, Unloader and Unloader Control Switch Fuse, 15 amp
4. Evaporator Blower Motor (EM1) Fuse, 15 amp
5. Evaporator Blower Motor (EM2) Fuse, 15 amp
6. Evaporator Blower Motor (EM1) Receptacle
7. Evaporator Blower Motor (EM2) Receptacle
8. Evaporator Blower Motor (EM3) Fuse, 15 amp
9. Evaporator Blower Motor (EM4) Fuse, 15 amp
10. Evaporator Blower Motor (EM2) Receptacle
11. Evaporator Blower Motor (EM4) Receptacle
12. Evaporator Blower Motor (EM5) Fuse, 15 amp
13. Evaporator Blower Motor (EM6) Fuse, 15 amp
14. Evaporator Blower Motor (EM5) Receptacle
15. Evaporator Blower Motor (EM6) Receptacle
16. Condenser Fan Motor (CM1) Fuse, 20 amp
17. Condenser Fan Motor (CM2) Fuse, 20 amp
18. Condenser Fan Motors (CM1 & CM2) Receptacle
19. Condenser Fan Motors (CM3 & CM4) Receptacle
20. Condenser Fan Motor (CM3) Fuse, 20 amp
21. Condenser Fan Motor (CM4) Fuse, 20 amp
22. Condenser Fan Motor (CM4) Relay
23. Condenser Fan Motor (CM3) Relay
24. Condenser Fan Motor (CM2) Relay
25. Condenser Fan Motor (CM1) Relay
26. Evaporator Blower Motors (EM5 & EM6) Relay
27. Condenser Motor Relay Control Relay
28. Evaporator Blower Motors (EM3 & EM4) Relay
29. Evaporator Blower Motor Relay Control Relay
30. Evaporator Blower Motors (EM1 & EM2) Relay
31. Compressor Clutch Relay
32. Temperature Control Relay
33. Temperature Controller Sensor Bulb
34. Temperature Controller
35. Positive Cable Lug

**Figure 1–3. Relay Control Board – Black Board**




## GREEN BOARD

**NOTES:** 1. To power the control relays, connections from an external junction point are made to terminals T8, T10 and Receptacle C2 (pin 2). Refer to section 2.3.1.

2. Components R7, C7, C8, F11 and F12 are spares in the Capri−180 unit.

1. Condenser Fan Motor (CM3 & CM4) Receptacle C10
2. Condenser Fan Motor (CM4) Fuse F18, 20 amp
3. Condenser Fan Motor (CM3) Fuse F17, 20 amp
4. Condenser Fan Motor (CM2) Fuse F16, 20 amp
5. Condenser Fan Motor (CM1) Fuse F15, 20 amp
6. Condenser Fan Motor (CM4) Relay R12
7. Condenser Fan Motor (CM3) Relay R11
8. Condenser Fan Motor (CM2) Relay R10
9. Evaporator Blower Motors (EM5 & EM6) Relay R7 (Used in 280 only)
10. Driver Switch Receptacle C2
11. Fault Relay R13
12. Fault Circuit Fuse F19, 15 amp
13. Evaporator Blower Motors (EM3 & EM4) Relay R5
14. Evaporator Blower Motors (EM1 & EM2) Relay R3
15. Compressor Clutch Control Relay R1
16. Compressor Clutch Fuse F2, 15 amp
17. Compressor Clutch Coil Receptacle C1
18. Positive Cable Post (24 vdc)
19. Negative Cable Post (24 vdc)
20. Temperature Control Relay R2
21. Evaporator Blower Motor (EM1) Receptacle C3
22. Evaporator Blower Motor (EM1) Fuse F3, 15 amp
23. Evaporator Blower Motor (EM2) Fuse F4, 15 amp
24. Evaporator Blower Motor (EM2) Receptacle C4
25. Evaporator Blower Motor (EM3) Fuse F7, 15 amp
26. Evaporator Blower Motor (EM4) Fuse F8, 15 amp
27. Evaporator Blower Motor (EM3) Receptacle C5
28. Evaporator Blower Motor (EM4) Receptacle C6
29. Evaporator Blower Motor (EM5) Fuse F11, 15 amp
30. Evaporator Blower Motor (EM5) Receptacle C7
31. Evaporator Blower Motor (EM6) Fuse F12, 15 amp
32 Evaporator Blower Motor (EM6) Receptacle C8
33. Condenser Fan Motor (CM1) Relay R9
34. Condenser Fan Motors (CM1 & CM2) Receptacle C9
35. Temperature Controller (TC)
36. Temperature Controller Sensor Bulb

**Figure 1−4. Relay Control Board − Green Board**

## 1.2 REFRIGERATION AND ELECTRICAL DATA

### a. Refrigerant Charge

| | |
|---|---|
| *Capri−280* **− R−22:** | 12.5 − 14 lbs. (5.67 − 6.4 kg) |
| *Capri−180* **− R−12:** | 4 lbs. each side (1.8 kg) |

### b. Compressor

*Capri−280*

| | |
|---|---|
| Model: | 05G Bus |
| No. of Cylinder: | 6 |
| No. of Unloaders: | 2 |
| Weight: | 142 lb (64.5 kg) |
| Compressor Oil Charge: | 9 U.S. Pints (4.3 Litres) |

Oil level should be between 1/4 to 1/2 of sight glass with the compressor in operation. (Refer to section 4.9.)

Approved Oils:

| | |
|---|---|
| Calumet Refining Co.: | R030 |
| Texaco : WF68 | |
| Witco Chemical Corp.: | Suniso 4GS |

*Capri−180*

| | |
|---|---|
| Model: | Sankyo 510 |
| No. of Cylinder: | 5 |
| Weight (Less service valves): | 23 lb (10.6 kg) |
| Compressor Oil Charge: | 4.6 fluid ounces (135 cc) |
| Approved Oil: | Esso S100 |

P/N07−00270−00P12

### c. Expansion Valve Superheat

Setting at: 12_F to 15_F (−11_C to −9.4_C)
(Maximum return air exceeding 75_F / 24_C)

### d. High Pressure Switch (HP)

Cutout: 410 ¦ 10 psig (28.8 ¦ .7 kg/cm@)
Cut−in: 300 ¦ 10 psig (21 ¦ .7 kg/cm@)

### e. Low Pressure Cutout Switch (LP)

Cutout: 4 ¦ 3 psig (.3 ¦ .2 kg/cm@)
Cut−in: 25 ¦ 3 psig (1.7 ¦ .2 kg/cm@)

### f. High Pressure Unloader Control Switch (HC)

Closes at: 375 ¦ 10 psig (26.4 ¦ .7kg/cm@)

### g. Weight (Approximate)

*Capri−280 − Advantage*

| | |
|---|---|
| Evaporator Assembly: | 160 lb (72 kg) |
| Condenser Assembly: | 190 lb (87 kg) |

*Capri−180*

| | |
|---|---|
| Evaporator Assembly: | 119 lb (54 kg) |
| Condenser Assembly: | 190 lb (87 kg) |

### h. Unit Amperage Draw

*Capri−280*

| | |
|---|---|
| 24 vdc Unit: | 100 amp |
| 12 vdc Unit (Skillcraft) | |

*Capri−180*

| | |
|---|---|
| 24 vdc Unit: | 80 amp |

## 1.3 SAFETY DEVICES

System components are protected from damage caused by unsafe or poor operating conditions by automatically shutting down sections of the unit when such conditions occur. This is accomplished by the safety devices listed in Table 1−3.

**Table 1−3. Safety Devices**

| Unsafe Conditions | Safety Device | Device Setting |
|---|---|---|
| 1. Excessive current draw on compressor clutch | 1. Fuse F1 − Black control board<br>Fuse F2 − Green control board | 1. Opens at 15 amps |
| 2. High compressor discharge pressure | 2. High pressure switch (HPS) (Automatic Reset) | 2. Opens at 410 ¦ 10 psig (28.8 ¦ .7 kg/cm@) |
| 3. Low compressor suction pressure | 3. Low pressure switch (LPS) (Automatic Reset) | 3. Opens at 4 ¦ 3 psig (.3 ¦ .2 kg/cm@) |
| 4. Frequent cycling of the compressor and clutch during high pressure conditions | 4. High pressure unloader control switch (HC) (05G Only) | 4. Closes at 375 ¦ 10 psig to unload (26.4 ¦ .7 kg/cm@) |
| 5. Excessive current draw on condenser fan motor | 5. Fuses F15, F16, F17 and F18 | 5. Opens at 20 Amps |
| 6. Excessive current draw on evaporator fan motor | 6. Fuses F3, F4, F7, F8, *F11 and *F12 | 6. Opens at 15 Amps |
| 7. High pressure in receiver tank | 7. Pressure relief valve | 7. Opens at 475 psig (33.4 kg/cm@) |
| 8. Excessive current draw by control panel circuit | 8. CB | 8. Opens at 150 Amps |

*Fuses F11 and F12 are not used on Capri 180.

## 1.4 REFRIGERANT SYSTEM FLOW (280 & 180)

The Capri−280 and 180 units operate as vapor compression systems when in operation. The main components of these systems are the (1) compressor(s), (2) air−cooled condensers, (3) thermostatic expansion valves, and (4) evaporators.

The Capri−280 unit consist of a single system using **R−22** refrigerant with a 05G compressor (see Figure 1−5). The Capri−180 unit consist of a dual system in parallel, and independent of each other, both using **R−12** refrigerant with a Sankyo compressor (see Figure 1−6).

The compressor(s) raise the pressure and the temperature of the vapor refrigerant and forces it through the discharge service valve to the condenser coils. The condenser fan circulates surrounding air over the outside of the condenser tubes. The tubes have fins designed to improve the transfer of heat from the refrigerant gas to the air. This removal of heat causes the refrigerant to liquefy; thus liquid refrigerant leaves the condenser and flows to the receiver.

The receiver serves as a liquid refrigerant reservoir when there are surges due to load changes in the system and as a storage space when pumping down the system.

The refrigerant leaves the receiver through a receiver manual outlet valve and flows through the filter−drier where an absorbent keeps the refrigerant clean and dry. The refrigerant leaves the filter−drier through a shut−off valve. (Some models are equipped with a valve at the inlet of the filter−drier also.)

The liquid refrigerant then flows through a moisture−liquid indicator(s) to the thermostatic expansion valve which reduces the pressure of the liquid and meters the flow of liquid refrigerant to the evaporator coil(s)

The liquid pressure drop in the expansion valves is accompanied by a drop in temperature; thus, the low pressure, low temperature liquid that flows into the evaporator tubes is colder than the air that is circulated over the evaporator tubes by the evaporator blowers. The evaporator tubes have aluminum fins to increase heat transfer; therefore heat is removed from the air circulated over the evaporator. This cooler air is circulated throughout the bus to maintain the pre−set interior temperature.

The transfer of heat from the air to the low temperature liquid refrigerant causes the liquid to vaporize in the evaporator. This low temperature, low pressure vapor passes through the suction line to the compressor where the cycle repeats.

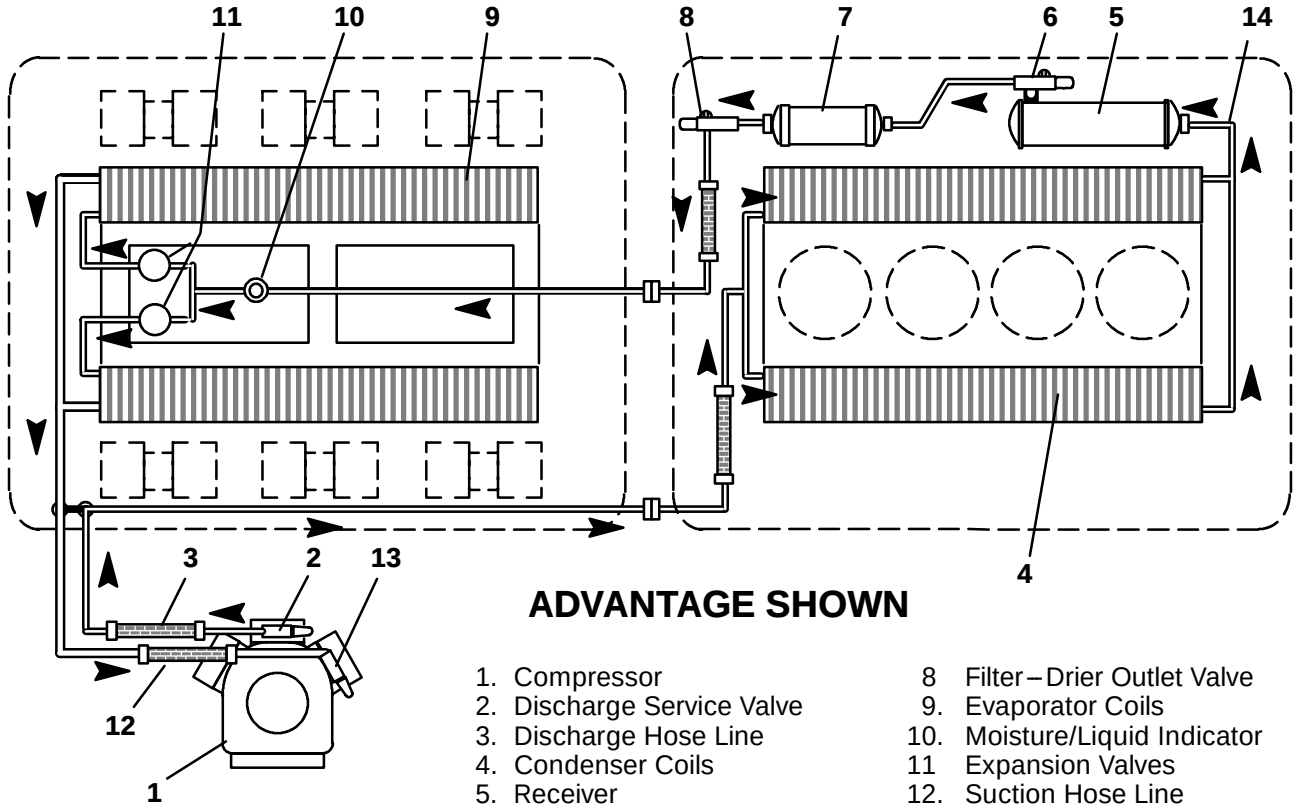
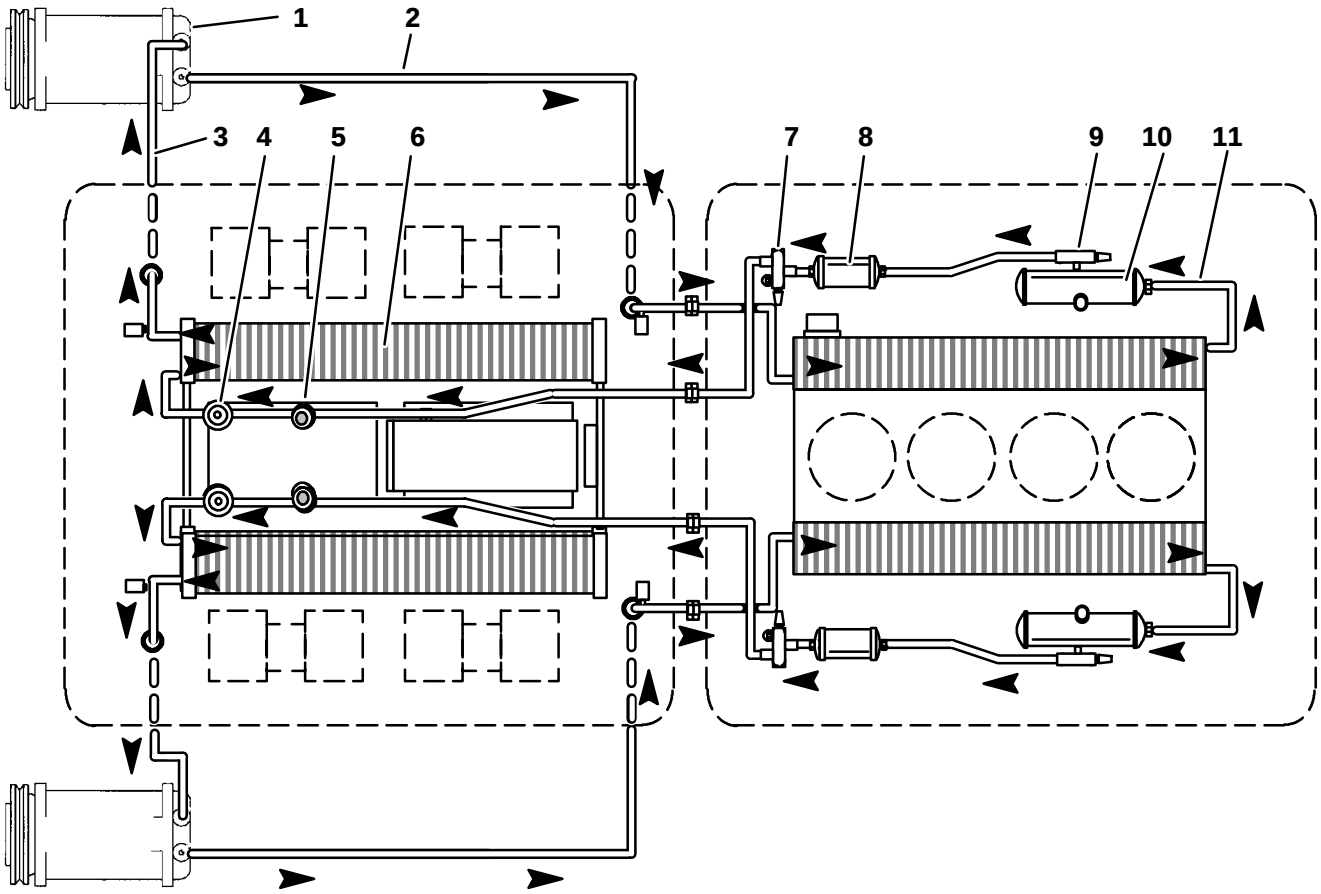



**Figure 1−5. System Refrigerant Flow Diagram − Capri−280**




1. Compressor
2. Discharge Line
3. Suction Line
4. Expansion Valves
5. Moisture/Liquid Indicator
6. Evaporator Coil
7. Filter–Drier Outlet Valve
8 Filter–Drier
9. Receiver Outlet Service Valve
10. Receiver
11. Liquid line

**Figure 1–6. System Refrigerant Flow Diagram – Capri–180**

# SECTION 2

# OPERATION

**WARNING**

**During operation, beware of unannounced starting of the condenser fans during the on/off cycling of the controller.**

## 2.1 PRE−TRIP INSPECTION

After starting unit allow system to stabilize (10 to 15 minutes) and proceed as follows:

1. Listen for abnormal noises.

2. Check compressor oil level. (Refer to section 4.10.2.)

3. Check refrigerant condition at moisture−liquid indicator. (Refer to section 4.12.)

## 2.2 STARTING AND STOPPING INSTRUCTIONS

### a. Starting

1. Start the vehicle engine.

2. Place the Air Conditioning switch in the ON position. The A/C light will come on.

**NOTE**

If the ambient air temperature is below 55_F (13_C), the ambient air switch will open and not allow the unit to start. The A/C light will not come on.

### b. Stopping

1. Place the Air Conditioning switch in the OFF position.

**NOTE**

Be sure air conditioning unit is turned off before stopping vehicle engine.

## 2.3 ELECTRICAL CONTROL CIRCUIT

The Capri−180 and Capri−280A & AW units are electrically similar in wiring and operation. One difference is that the Capri−280 is equipped with six evaporator blower motors while the Capri−180 has only four. Thus, the 180 does not use relay R7 or Fuses F11 and F12 on the relay control board. Second, the Capri−180 because of the dual system is equipped with an additional compressor clutch coil (CL2), high pressure switch (HPS), and low pressure switch (LPS). The clutch coils are wired in parallel and the HPS and LPS switches are wired in series with each other.

Most units are 24 vdc control circuits with 24 vdc components. There are some special 12 vdc application in the field. This section will address the 24 vdc circuit systems only, since the 12 vdc units are similar in operation.

**NOTE**

Units may be equipped with either a BLACK or GREEN relay control board (located in the evaporator section of the system). The following A/C circuit description incorporates the differences.

24 vdc is connected from the bus electrical system to the drivers A/C switch. Wired is series with the switch is the ambient air switch (SW2) which senses exterior ambient air temperature. If the ambient air is below 55_F (13_C), the switch will open to prevent the unit from starting. The output of SW2 switch is wired to a junction terminal, from which point the A/C light (ACL), receptacle C2 (pin 2), and terminals T8 and T10 (located on the relay control board) are wired to.

A separate 24 vdc circuit is also supplied from the bus electrical system to the main cable lugs of the relay control board to power the condenser fan motors, evaporator fan blowers, unloaders (if equipped) and compressor clutch(s), which are connected to the relay control board by wiring harnesses.

### 2.3.1 Air Conditioning Circuit

**NOTE**

Reference to normally open (NO) and normally closed (NC) relay contacts indicates the position of the contacts with the unit in the OFF position.

Air conditioning temperature control is accomplished by the temperature controller cycling the compressor clutch and condenser fans on and off to maintain the set point temperature.

When the A/C switch is placed in the ON position, 24 vdc power is fed from the A/C switch through the ambient air switch (if closed) to the A/C light (ACL), receptacle C2 (pin 2), terminals T8 and T10 on the relay control board.

The following components will become energized:

### a. GREEN Relay Control Board Applications

*Temperature Control Thermostat (TC)*

The temperature control thermostat (TC) is factory pre−set at 65_F ¦ 3_F (18_C ¦ 1.7_C) set point. The TC cycles the system on and off through relay R2 according to the bus interior air temperature.

*Relay R2*

Above set point, A/C is activated when the 24 vdc flows from C2 (pin 2) through the temperature control

relay R2 contacts to energizes the compressor clutch relay coil R1 to engage the clutch (starting the refrigerant flow) and the condenser fan relay coils R9, R10, R11, and R12 to start the condenser fans.

Below set point, when the TC energizes relay R2, the normally closed contacts will open to de−energize relay coil R1 to disengage the clutch and relay coils R9, R10, R11, and R12 to stop the condenser fans.

*Relay R1*

Energizing the clutch coil relay R1 through the R2 contacts will close the normally open R1 contacts to allow 24 vdc to flow from the positive terminal of the control board through fuse F2 to energize and engage the compressor clutch(s).

If the high or low pressure switch opens due to a malfunction in the system, the ground circuit to R1 will open. This will de−energize relay R1 to open the contacts which will disengage the compressor clutch(s).

*Relays R9, R10, R11, and R12*

From the A/C switch, 24 vdc is supplied through the normally closed R2 contacts to energizes the condenser fan motor coils R9, R10, R11, and R12.

Energizing the condenser fan motor relay coils will close the normally open relay contacts. The closed contacts will allow 24 vdc to flow from the positive terminal of the control board through fuses F15, F16, F17, and F18 through the plug connectors C9 and C10 to start the four condenser fan motors.

*Relay R13*

Energizing relay coil R13 will toggle the switch to contact 87 to open the fault light circuit. If the high or low pressure switch opens due to an unsafe condition in the system, the ground circuit to relay R13 will be broken. This will de−energized the relay and toggle the switch to contact 87a, to allow power from terminal T10 through fuse F19 to activate the fault light (FL); indicating a problem with high or low pressure in the system.

*Relays R3, R5 and R7*

Energizing the evaporator blower motor relay coils R3, R5, and R7 will close the normally open contacts. Closing the contacts will allow 24 vdc to flow from the positive terminal of the relay control board through the contacts and fuses F3, F4, F7, F8, F11, and F12 to start the evaporator blower motors.

The Capri−180 units have four evaporator blower motors and do not use relay R7 or Fuses F11 and F12.

A/C Fault Circuit

If the high or low pressure switch opens due to a malfunction in the system, the ground circuit will be broken to relay coils R1 and R13. This will de−energize relay R1, to disengaging the compressor clutch(s) to prevent any damage to the compressor, and relay R13 to activate the fault light (FL). Refer to the relay R13 description in this section for the fault light operation.

**b. BLACK Relay Control Board Applications**

*Temperature Control Thermostat (TC)*

The temperature control thermostat (TC) is factory pre−set at 65_F ¦ 3_F (18_C ¦ 1.7_C) set point. The TC cycles the system on and off through relay R2 according to the bus interior air temperature.

*Relay R16*

Energizing relay coil R16 will close the normally open contact. Closing this contact will complete a ground circuit for the condenser fan motor relay coils R9, R10, R11, and R12. Also, a ground circuit will be completed for the compressor clutch relay coil R1. The ground circuit that has been created by closing the R16 contact flows through the high and low pressure switches (HP & LP) to a ground.

*Relay R2*

Above set point, A/C is activated when the 24 vdc flows from the positive terminal of the relay control board through the relay R2 contacts to allow 24 vdc to relays R1, R9, R10, R11, and R12.

Below set point, when the TC energizes relay R2, the normally closed contacts will open to de−energize relay coil R1 to disengage the clutch and relay coils R9, R10, R11, and R12 to stop the condenser fans.

*Relay R1*

Energizing the clutch coil relay R1 through the R2 contacts will close the normally open R1 contacts to allow 24 vdc to flow from the positive terminal of the control board through fuse F1 to energize and engage the compressor clutch.

If the high or low pressure switch opens due to a malfunction in the system, the ground circuit to R1 will open. This will de−energize relay R1 to open the contacts which will disengage the compressor clutch.

*Relays R9, R10, R11, and R12*

From the positive terminal of the control board, 24 vdc is continuously supplied through the normally closed R2 contacts to the condenser fan motor relays R9, R10, R11, and R12.

These coils are energized by completing their ground circuit through the R16 contacts. (Refer to section 2.3.1.b.) Energizing the relay coils will close the normally open relay contacts. The closed contacts will allow 24 vdc to flow from the positive terminal of the control board through fuses F15, F16, F17, and F18 through the plug connectors C9 and C10 to start the four condenser fan motors.

*Relay R13*

Energizing relay coil R13 will close the normally open contacts to allow 24 vdc to flow from the positive

terminal of the control board to the evaporator motor relays R3 R5, and R7

*Relays R3, R5 and R7*

Energizing the evaporator blower motor relay coils R3, R5, and R7 will close the normally open contacts. Closing the contacts will allow 24 vdc to flow from the positive terminal of the relay control board through the contacts and fuses F3, F4, F7, F8, F11, and F12 to start the evaporator blower motors.

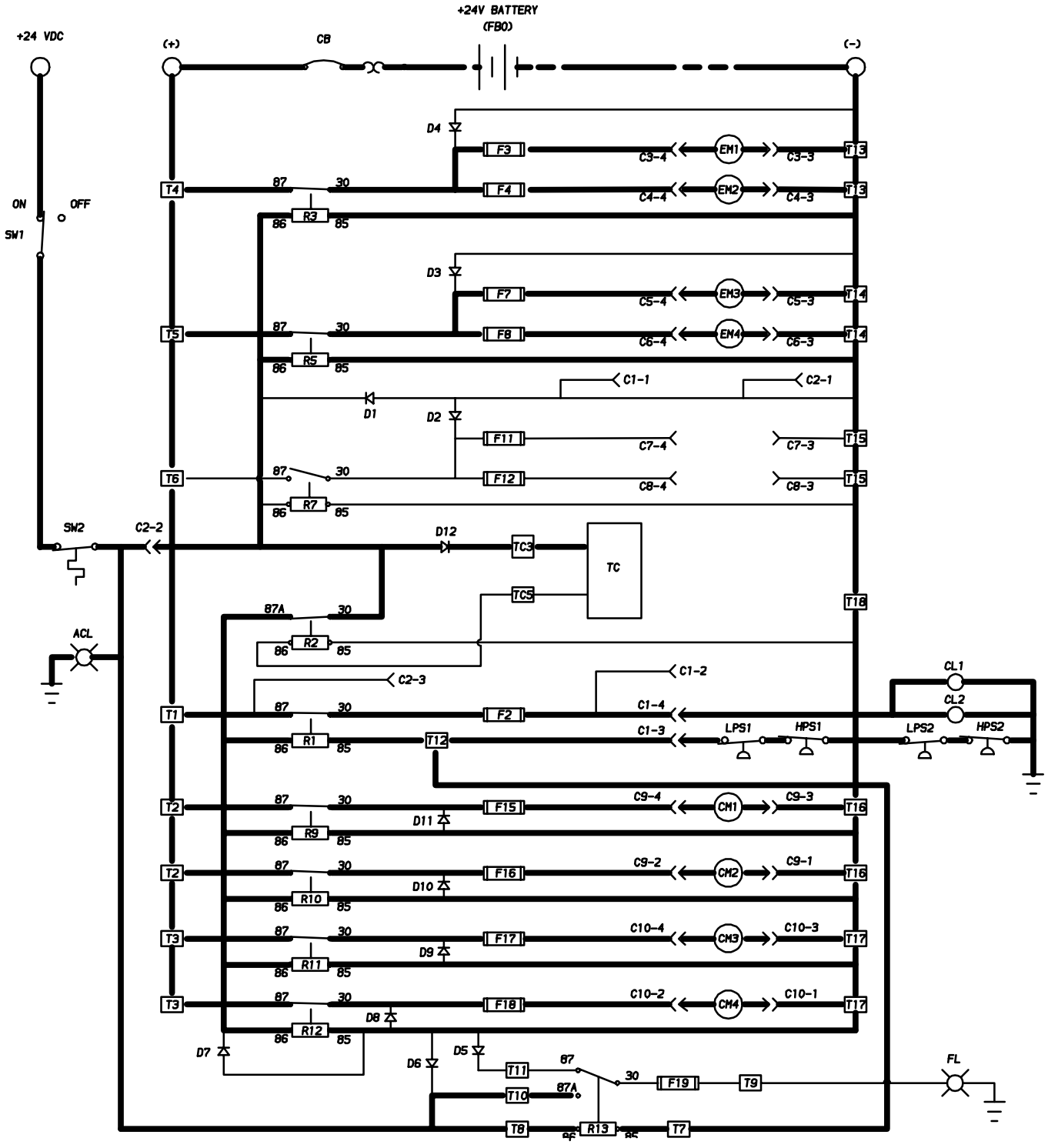
Compressor Unloader Circuit – *280 Only*

The function of the unloaders are to reduce the compressor from a six cylinder to a two cylinder operation when high pressure in the system exist. If the pressure in the system reaches 365 psig, the high pressure unloader control switch (HC) will close. When the HC switch closes, 24vdc will be supplied to energize the unloaders to drop out four of the six compressor cylinders. The HC switch is located on the filter drier outlet service valve on Advantage units. On Advantage Wide units, the HC switch is located on the discharge line in the condenser section.

A/C Fault Circuit

If the high or low pressure switch opens due to a malfunction in the system, the ground circuit will be broken to relay coils R1, R9, R10, R11, and R12. This will de–energize relay R1, to disengaging the compressor clutch, and relays R9, R10, R11, and R12 to stopping the condenser fan motors.

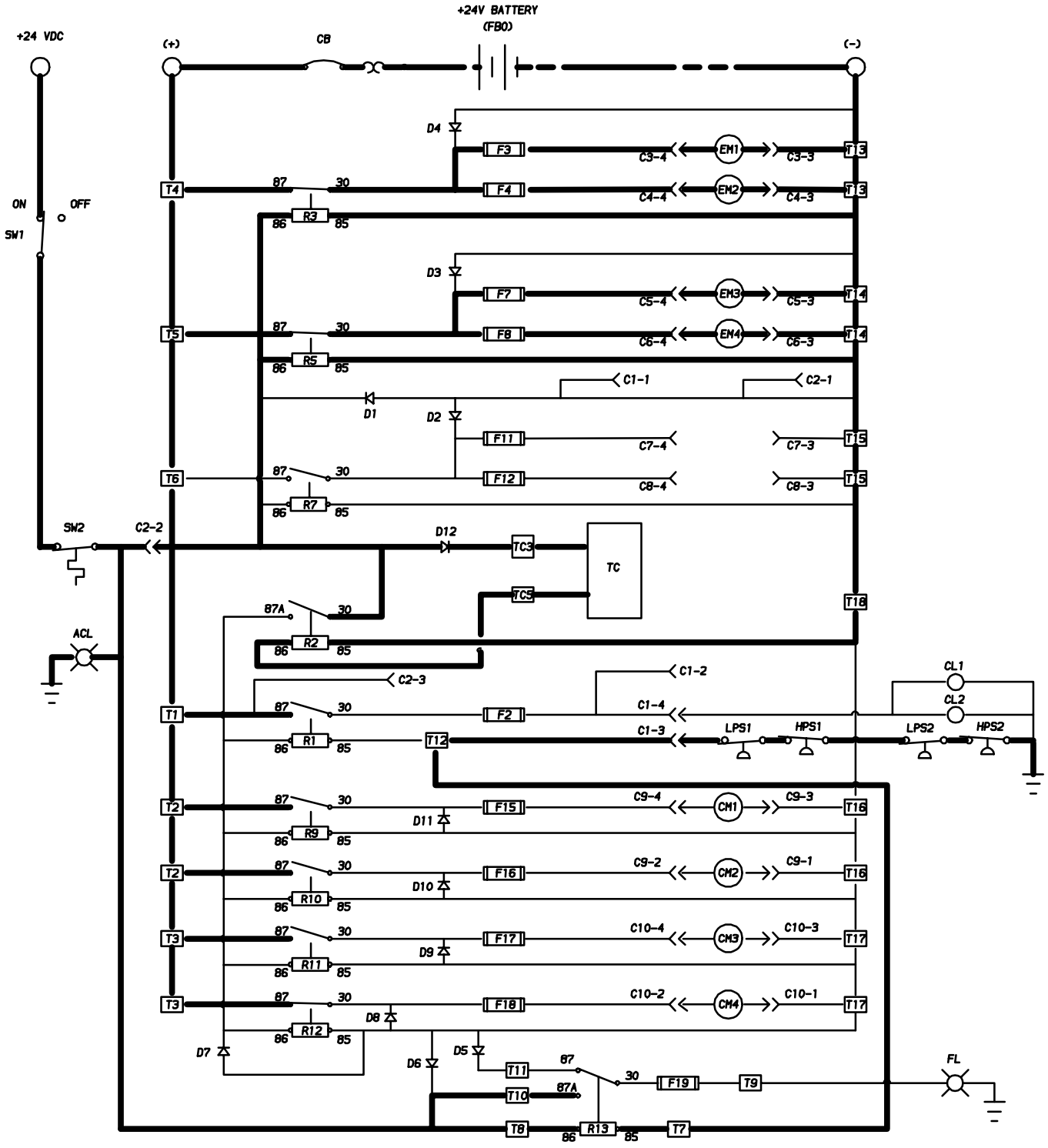
At this point low current flowing through the de–energized relay coils (R9, R10, R11, R12 and R1) will deviate to the fault relay coil (FR) to complete this circuit. This will energize the fault relay coil to close the normally open fault relay contact to activate the fault light (FRL); indicating a problem with high or low pressure in the system.




# Green Board – Above Set Point

Energized Circuit — De–energized Circuit

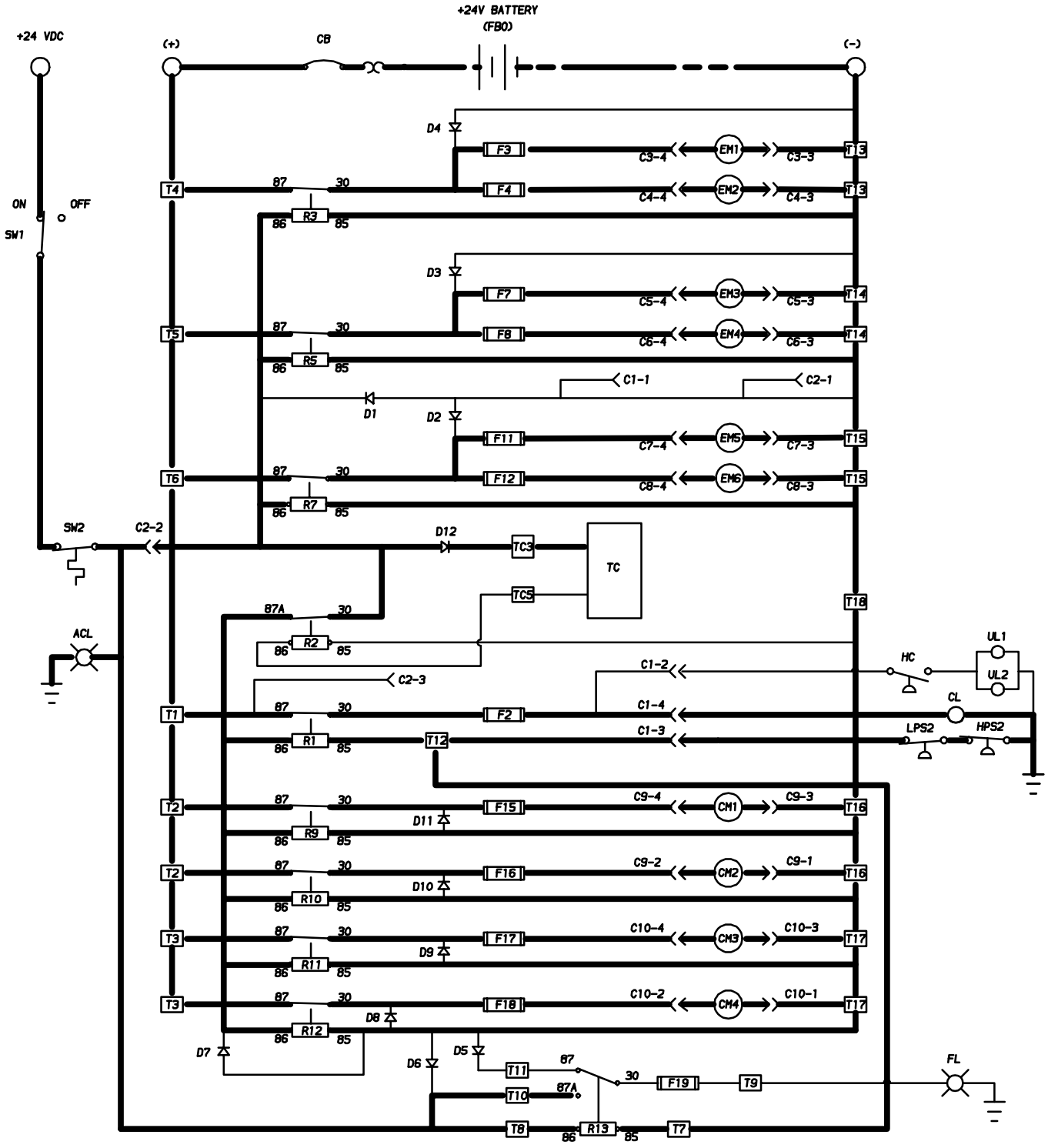
**Figure 2–1. Air Conditioning Circuit – Capri–180 (Green Control Board)**




## Green Board – Below Set Point

Energized Circuit — De–energized Circuit

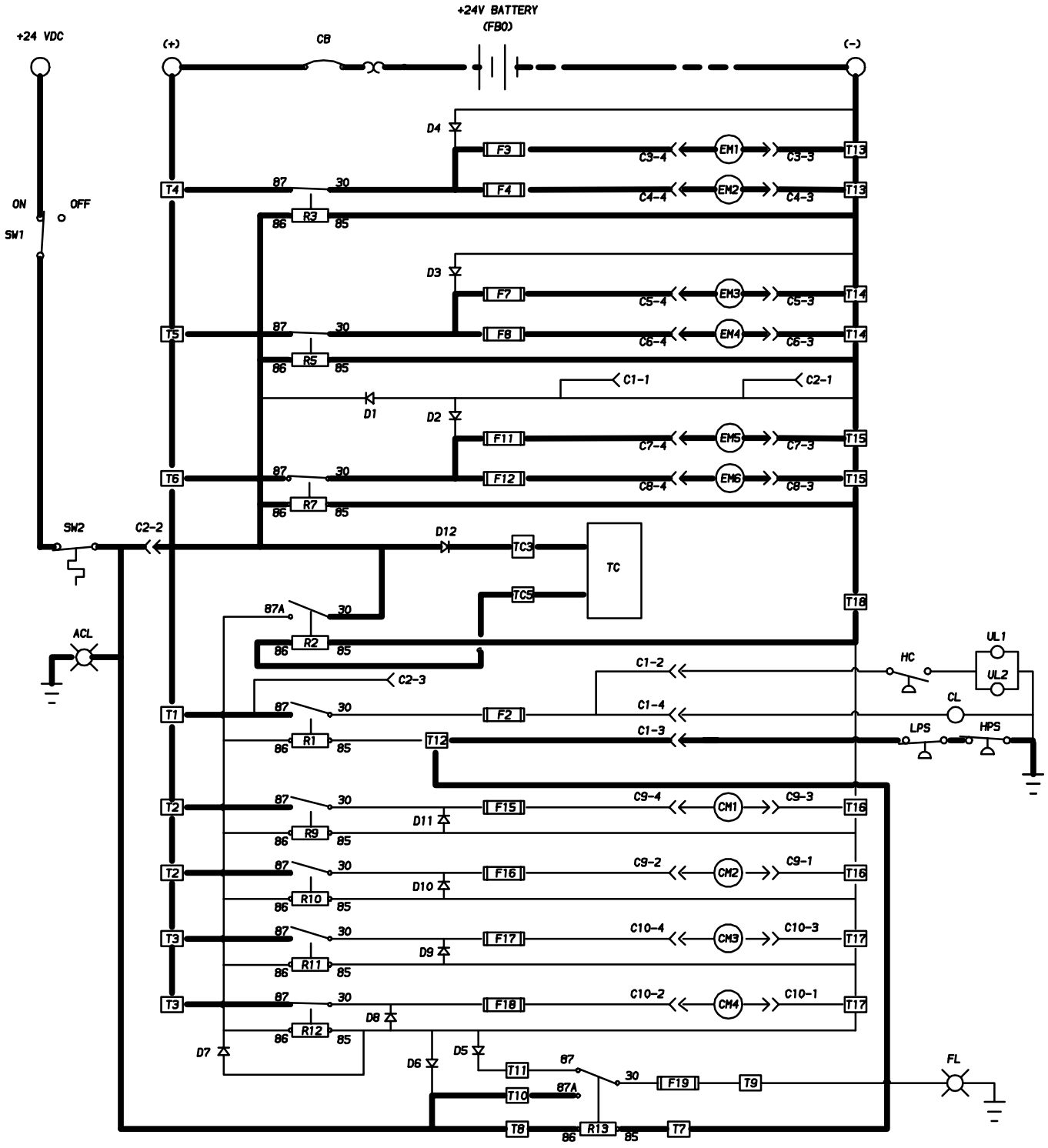
**Figure 2–2. Air Conditioning Circuit – Capri–180 (Green Control Board)**




# Green Board – Above Set Point

Energized Circuit — De–energized Circuit

**Figure 2–3. Air Conditioning Circuit – Capri–280 (Green Control Board)**




# Green Board – Below Set Point

Energized Circuit ——— De–energized Circuit

**Figure 2–4. Air Conditioning Circuit – Capri–280 (Green Control Board)**

# SECTION 3

# TROUBLESHOOTING

| INDICATION/ TROUBLE | POSSIBLE CAUSES | REFERENCE PARAGRAPH |
|---|---|---|
| **3.1 UNIT WILL NOT COOL** | | |
| Compressor will not run | Fuse F2 defective – green board | Check/Replace |
| | Fuse F1 defective – black board | Check/Replace |
| | Relay R1, R2 or R16 (black board only) defective | 2.3 |
| | V–Belt defective | Check |
| | Compressor malfunction | 4.10* |
| | Clutch malfunction | Check/Replace |
| | Safety device open | 1.4 |
| | Temperature control module defective | Check |
| Fail Light On | High or Low pressure switch open | 2.3/4.11 |
| **3.2 UNIT RUNS BUT HAS INSUFFICIENT COOLING** | | |
| Compressor | Compressor valves defective – O5G only | 4.10* |
| | V–belt loose | Check |
| | Unloader Malfunction – O5G only | 4.10 |
| Refrigeration system | Abnormal pressures | 3.4 |
| | No or restricted evaporator air flow | 3.6 |
| | Expansion valve malfunction | 3.7 |
| | Restricted refrigerant flow | 4.3 & 4.5 |
| | Unloader Malfunction | 4.10 |
| **3.3 ABNORMAL PRESSURE** | | |
| High discharge pressure | Refrigerant overcharge | 4.3 |
| | Inoperative Condenser Fan Motor(s) | Check |
| | Noncondensibles in system | 4.5 |
| | Condenser fan motor rotation incorrect | Check |
| | Condenser coil dirty | Clean |
| | Relay R9, R10, R11, R12 or R16 (black board only) defective | Check |
| | Fuse F15, F16. F17. or F18 defective | Check |
| Low discharge pressure | Compressor valves(s) worn or broken – O5G only | 4.10* |
| | Low refrigerant charge | 4.10 |
| High suction pressure | Compressor valves worn or broken – O5G only | 4.10* |
| | Unloader Malfunction | 4.10 |
| Low suction pressure | Suction service valve partially closed – O5G only | Open |
| | Receiver outlet valve partially closed | Open |
| | Filter–drier outlet valve partially closed | Open |
| | Filter–drier partially plugged | 4.13 |

*****Refer to the applicable compressor service manual for additional servicing and specifications. For 05G Bus compressors, refer to service manual T–199 and parts list T–200. For Sankyo compressors, refer to manufacture literature.

| INDICATION/ TROUBLE | POSSIBLE CAUSES | REFERENCE PARAGRAPH |
|---|---|---|
| **3.3 ABNORMAL PRESSURE CONT'D** | | |
| Low suction pressure (cont'd) | Low refrigerant charge | 4.10 |
| | Inoperative Evaporator Fan Motor(s) | Check |
| | Expansion valve malfunction | 3.7 |
| | Restricted air flow | Check |
| Low evaporator air flow | Blower running in reverse | Check |
| | Dirty air filter | Clean |
| | Icing of coil | Clean |
| | Relay R3, R5, R7. or R13 (black board only) defective | 2.3 |
| | Fuse F3, F4, F7, F8, F11, or F12 defective | 2.3 |
| Suction and discharge pressures equalize when operating | Compressor valves defective (O5G only) | 4.10* |
| **3.4 ABNORMAL NOISE AND VIBRATIONS** | | |
| **3.4.1 ABNORMAL NOISE** | | |
| Compressor | Loose mounting bolts | 4.10* |
| | Worn bearings | 4.10* |
| | Worn or broken valves | 4.10* |
| | Liquid slugging | 3.7 |
| | Insufficient oil | 4.10.2* |
| | Clutch loose or rubbing | Check |
| Condenser or Evaporator fan | Loose or defective bearings | Check /Replace |
| | Blade Interference | Check |
| | Blade broken or missing | Check |
| **3.4.2 ABNORMAL VIBRATION** | | |
| Compressor | Loose mounting bolts | 4.10 |
| Evaporator or Condenser fan | Bent shaft on motor | Replace motor |
| | Blade broken or missing | Check |
| **3.5 TEMPERATURE CONTROLLER MALFUNCTION** | | |
| Will not control | Controller defective | Replace |
| | Sensor defective | Replace |
| | Defective wiring | Check |

*****Refer to the applicable compressor service manual for additional servicing and specifications. For 05G Bus compressors, refer to service manual T–199 and parts list T–200. For Sankyo compressors, refer to manufacture literature.

| INDICATION/ TROUBLE | POSSIBLE CAUSES | REFERENCE PARAGRAPH |
|---|---|---|
| **3.6 NO EVAPORATOR AIR FLOW OR RESTRICTED AIR FLOW** | | |
| No evaporator air flow | Motor burnout | Replace |
| | Fan damage | Replace |
| | Brushes defective | Replace |
| | Return air filter dirty | Check |
| | Relay R3, R5, R7. or R13 (black board only) defective | 2.3 |
| | Fuse F3, F4, F7, F8, F11, or F12 defective | 2.3 |
| | Wiring polarity incorrect | Figure 5–1 |
| **3.7 EXPANSION VALVE MALFUNCTION** | | |
| Low suction pressure with high superheat | Low refrigerant charge | 4.4 & 4.10 |
| | Wax, oil or dirt plugging valve orifice | Check |
| | Ice formation at valve seat | 4.4 & 4.14 |
| | Superheat setting too high | 4.14 |
| | Power assembly failure | 4.14 |
| | Loss of bulb charge | 4.14 |
| | Broken capillary | 4.14 |
| | Loose bulb | Check |
| Low superheat and liquid slugging in compressor | Superheat setting too low | 4.14 |
| | Ice holding valve open | 4.3.b & 4.5 |
| | Foreign material in valve | 4.14 |
| | Pin and seat of expansion valve eroded or held open by foreign material | 4.14 |
| Fluctuating suction pressure | Improper bulb location or loose bulb installation | 4.14 |
| | Low superheat setting | 4.14 |

*****Refer to the applicable compressor service manual for additional servicing and specifications. For 05G Bus compressors, refer to service manual T–199 and parts list T–200. For Sankyo compressors, refer to manufacture literature.

# SECTION 4

# SERVICE

**WARNING**

**BEWARE OF ROTATING FAN BLADES AND UNANNOUNCED STARTING OF FANS.**

## 4.1 MAINTENANCE SCHEDULE

| Unit ON | Unit OFF | Operation | Reference Paragraph |
|---|---|---|---|
| | | **4.1.1 Daily Inspection** | |
| X | | Pre−trip inspection − after starting | 2.1 |
| | X | Check tension and condition of Compressor V−belt(s) | None |
| | | **4.1.2 Weekly Inspection and Maintenance** | |
| | X | Perform daily inspection | 4.1.1 |
| | X | Check condenser, evaporator coils and air filters | None |
| | X | Check refrigerant hoses and compressor shaft seal for leaks (O5G) | 4.6 |
| X | | Feel filter−drier for excessive temperature drop across drier, indicating restriction. | 4.13 |
| | | **4.1.3 Monthly Inspection and Maintenance** | |
| | X | Perform weekly inspection and maintenance | 4.1.2 |
| | X | Clean evaporator drain pan and hose(s) | None |
| | X | Check wire harness for chafing and loose terminals | Replace/ Tighten |
| | X | Check fan motor bearings | None |
| | X | Check compressor mounting bolts for tightness | Check |
| | X | Check fan motor brushes | None |

## 4.2 SUCTION AND DISCHARGE SERVICE VALVES

The suction and discharge service valves used on the compressor are equipped with mating flanges for connection to flanges on the compressor. These valves are provided with a double seat and a gauge connection, which enable servicing of the compressor and refrigerant lines.

Turning the valve stem clockwise (all the way forward) will frontseat the valve to close off the suction or discharge line and opens the gauge connection to the compressor. See Figure 4−1. Turning the valve stem counterclockwise (all the way out) will backseat the valve to open the suction or discharge line to the compressor and close off the gauge connection.

With the valve stem midway between frontseated and backseated positions, suction or discharge line is open to both the compressor and the gauge connection.

For example, when connecting manifold gauge to measure suction or discharge pressure, valve stem is fully backseated. Then, to measure suction or discharge pressure, crack open the valves 1/4 to 1/2 turn.

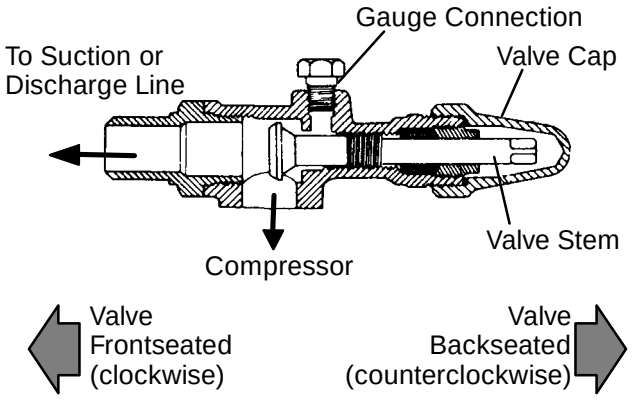



**Figure 4−1. Suction or Discharge Service Valve**

## 4.3 INSTALLING MANIFOLD GAUGES

The manifold gauge set can be used to determine system operation pressure, add charge, purge, and equalize the system.

The manifold gauge in Figure 4–2 shows hand valves, gauges and refrigerant openings. When the low pressure hand valve is frontseated (turned all the way in), the low (evaporator) pressure can be checked. When the high pressure hand valve is frontseated, high (condensing) pressure can be checked. When both valves are open (turning counter clockwise), high pressure vapor will flow into the low side. When the low pressure valve is open, the system can be charged. Oil can also be added to the system.

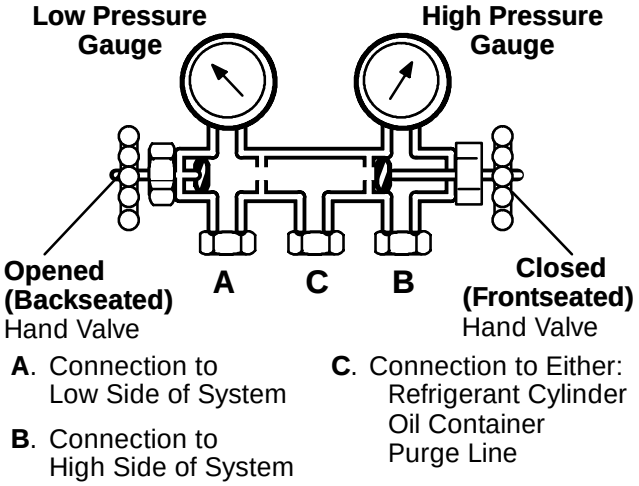

Low Pressure Gauge
High Pressure Gauge
Opened (Backseated) Hand Valve
A
C
B
Closed (Frontseated) Hand Valve
A. Connection to Low Side of System
B. Connection to High Side of System
C. Connection to Either: Refrigerant Cylinder Oil Container Purge Line

**Figure 4–2. Manifold Gauge Set**

### a. Installing the Manifold Gauge Set

1. Remove both service valve stem caps and backseat (counter clockwise) valve before removing

2. Connect the high side hose *tightly* to discharge service valve port.

3. Connect the low side hose *loosely* to suction service valve port.

4. Loosen charging (center) hose at dummy fitting of manifold set.

5. Frontseat (clockwise) both manifold gauge hand valves.

6. Crack open discharge service valve 1/4 to 1/2 turns.

7. Slowly open (counter clockwise) manifold discharge hand valve approximately one turn.

8. Tighten charging hose on to dummy fitting.

9. Slowly open the manifold suction hand valve to purge line.

10. Tighten suction hose at the suction service valve port.

11. Frontseat (close) both manifold hand valves.

12. Crack open suction service valve 1/4 to 1/2 turns.

**WARNING**

**Never open the high side manifold hand valve while the system is operation when a drum of refrigerant is attached to the center hose.**

## 4.4 PUMPING THE UNIT DOWN

To service the filter–drier, sight glass, expansion valve, evaporator coil, and suction line hoses, pump the refrigerant into condenser coil and receiver as follows:

1. Attach manifold gauge set to compressor suction and discharge service valves.

2. Open manifold gauge valves two turns (clockwise). Purge gauge line.

3. Close valve at the receiver outlet by turning clockwise. Start unit and run in cooling. The unit will shut down at 4 psig (cut–out of low pressure switch).

4. Frontseat (close) discharge service valve and the refrigerant will be trapped between the compressor suction service valve and the receiver manual shutoff valve.

5. Before opening up any part of the system, a slight positive pressure should be indicated on the pressure gauge. If a vacuum is indicated, open the receiver outlet valve momentarily to build up a slight positive pressure.

6. When opening up the refrigerant system, certain parts may frost. Allow the part to warm to ambient temperature before dismantling. This avoids internal condensation which causes moisture in the system. Before completely removing any component in the system, make sure refrigerant pressure is released.

7. When service operation is complete, purge air from parts by again emitting refrigerant as described in step 5. above. Connect the parts which were dismantled.

8. Open (backseat) receiver outlet and midseat suction service valve.

9. Leak check connections with a leak detector. (Refer to section 4.4.)

10. Start the unit in cooling and check the refrigerant charge per section 4.6.

**NOTE**

Whenever the system is opened, it must be evacuated and dehydrated, and the filter–drier changed. (Refer to section 4.7.)

## 4.5 REMOVING REFRIGERANT CHARGE

When servicing the condenser coil, receiver or discharge line, a refrigerant reclaimer (recovery system) should always be used whenever removing contaminated refrigerant from the system. For the recovery system procedure, refer to instructions provided by the manufacture. Make note of the correct refrigerant being removed (280 models use R–22 and 180 models use R–12).

If the refrigerant is not contaminated, the following faster procedure can be used to store the refrigerant in an evacuated container as follows:

### a. Equipment Required

1. Appropriate returnable refrigerant cylinder, preferably a 60 – 120 lb net capacity may be used. Refrigerant removal will be faster and more complete with the larger cylinder.

**WARNING**

**Do not use a disposable refrigerant container to store the charge as an explosion may occur.**

2. Refrigerant service gauge manifold.

3. Vacuum pump, preferably 5 cfm (8 cu/H), CTD P/N 07–00176–01.

4. Weight scale (0 to 100 lb = 0 to 46 kg range, minimum).

5. 3/8 inch evacuation hoses or 3/8 inch copper tubing with 1/4 inch female flare adapter on each end. *Do not use hose or tubing of smaller diameter or the removal process will take considerably longer.*

### b. Procedure

**NOTE**

The following procedure must be done to each or both systems (if necessary) in the Capri–180 unit.

1. Evacuate and dehydrate a returnable refrigerant cylinder. After the cylinder has been evacuated, close cylinder valve. Shut off vacuum pump and remove.

2. For Capri–280 applications (O5G compressor), backseat compressor service valves and connect a service manifold. Tighten connections at compressor service valves. Attach lines loosely to manifold. Be sure manifold valves are frontseated. One at a time, crack open compressor service valves to purge lines. Tighten connections at manifold. Midseat service valves.

For Capri–180 applications (Sankyo compressor), attach lines to the compressor suction and discharge schrader valve ports from the service gauge manifold. The schrader valves opens as soon as the connection is made. Purge lines through the center port of the manifold gauge set.

3. Place evacuated refrigerant cylinder on scales and note weight of empty cylinder. Leave cylinder on scale.

4. Midseat the manifold valves to allow the refrigerant to flow from the higher pressure system to the low pressure cylinder.

5. Monitor system pressure and weight of refrigerant cylinder to determine how much refrigerant is being removed. Shut off the cylinder valve when the system pressure holds steady and frontseat gauge manifold (unit and cylinder pressures have equalized). At this time, all the refrigerant that can be removed quickly is in the cylinder. Not all the refrigerant will be removed at this point.

6. Connect a refrigerant reclaimer to the system to remove the remaining refrigerant.

7. Service or replace the necessary components in the system.

**NOTE**

When opening up the refrigerant system, certain parts may frost. Allow the part to warm to ambient temperature before dismantling. This avoids internal condensation which puts moisture in the system.

8. Perform a refrigerant leak check, section 4.4, and evacuate and dehydrate the system, section 4.5, before recharging refrigerant as detailed in section 4.6.

**NOTES**

1. It is good practice to place a USED REFRIGERANT tag on cylinder.

2. Install a drier in the charging line when recharging this refrigerant into the system *if there is the slightest possibility that moisture had entered the system*.

## 4.6 REFRIGERANT LEAK CHECKING

a. If system was opened and repairs completed, leak check the unit.

b. The recommended procedure for finding leaks in a system is with a halide torch or electronic leak detector. Testing joints with soapsuds is satisfactory only for locating large leaks.

c. If system is without refrigerant, charge system with the appropriate refrigerant to build up pressure between 58 to 86 psig (4.1 to 6 kg/cm@). Remove refrigerant drum and leak check all connections.

**NOTE**

It must be emphasized that the correct Refrigerant drum be used to pressurize the system. Refer to section 1.2. Any other gas or vapor will contaminate the system which will require additional purging and evacuation of the high side (discharge) of the system.

d. Remove refrigerant with a reclaimer and repair any leaks.

e. Evacuate and dehydrate the unit. Refer to section 4.7.

f. Charge the unit with the appropriate refrigerant. Refer to section 4.8.

## 4.7 EVACUATION AND DEHYDRATION

Proper evacuation and dehydration procedures are imperative when servicing (repairs and replacing components) the air conditioning system to ensure good performance and long compressor life.

The results of improper evacuation are harsh. Noncondensible gases in the system result in high head pressure; moisture may cause ice blockage at the expansion valve; moisture and refrigerant may react to form an acid. This acid may cause copper plating of the bearing surfaces and eventual compressor failure.

### a. Equipment Needed

1. **Vacuum Pump –** A good vacuum pump (3 to 5 cfm volume displacement, at atmospheric pressure) A pump of this capacity is available through the Carrier Service Parts, CTD P/N 07–00176–01.

2. **Thermistor Vacuum Gauge –** A thermistor vacuum gauge (electronic vacuum gauge) measures the low absolute pressures necessary to remove moisture from the system. *A compound gauge (manifold gauge set) is not recommended because of it's inherent inaccuracy.* A vacuum gauge is available from a refrigeration supplier.

3. **Evacuation Hoses –** Three 3/8" evacuation hoses, the length to be determined by the application of the service set–up. (Evacuation hoses are available from your local refrigeration supplier.) Do not use standard refrigeration hoses to evacuate. These standard hoses are designed for pressure not vacuum and may collapse during evacuation.

4. **Reclaimer –** A reclaimer is recommended for removing the refrigerant. The reclaimer may or may not be equipped with a refrigerant cylinder port.

5. **Evacuation Manifold –** A evacuation manifold is necessary for connecting the equipment needed for a proper evacuation. The evacuation manifold can be made easily as shown in Figure 4–3. An additional port is added to the manifold for the refrigerant cylinder if the reclaimer is not equipped with a cylinder connection.

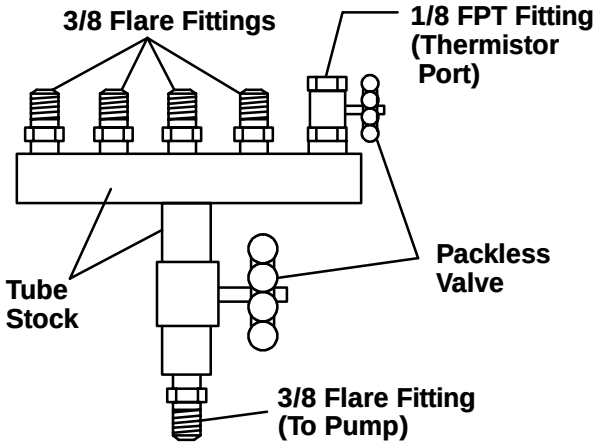
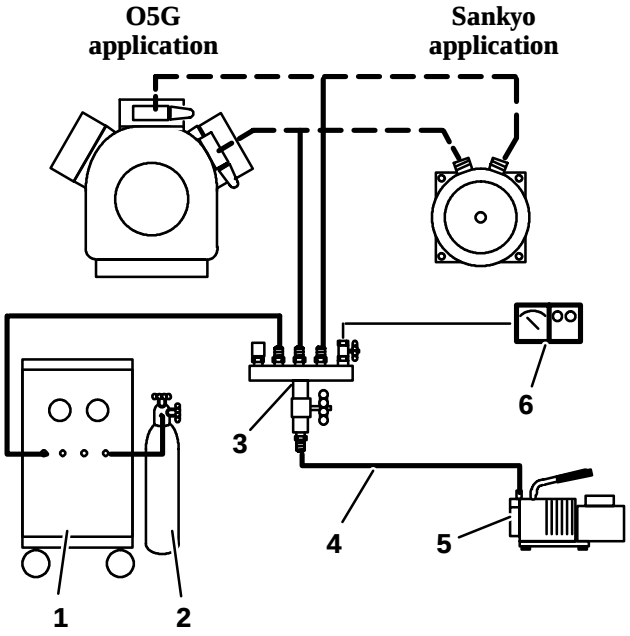



**Figure 4–3. Evacuation Manifold**

### 4.7.1 Procedure for Evacuation and Dehydrating System

Evacuation Procedure #1 should be performed after a major system repair such as a compressor, evaporator or condenser replacement. Evacuation Procedure #2 should be performed after a brief system repair such as a filter/drier, TXV, moisture indicator, receiver or service valve replacement.

To help speed up the evacuation process, keep the ambient temperature above 60_F (15.6_C) to increase the evaporation of moisture. If ambient temperature is lower than 60_F (15.6_C), ice may form before moisture removal is complete. Heat lamps or alternate sources of heat may be used to raise system temperature if necessary.




1. Reclaimer
2. Refrigerant Cylinder
3. Evacuation Manifold
4. Evacuation Hose
5. Vacuum Pump
6. Thermistor Gauge

**Figure 4–4. Evacuation Set Up**

**a. Evacuation Procedure #1 (Triple evacuation)**

1. Evacuate and dehydrate only after pressure leak test. Refer to section 4.6.

2. Connect evacuation manifold, vacuum pump, vacuum gauge, reclaimer and hoses as shown in Figure 4–4. All hand valves on manifold should be closed. The O5G compressor service valves should be midseated. The reclaimer valve should be closed.

3. Start vacuum pump. Slowly open manifold valve to the pump. Open valve to the vacuum gauge. Evacuate until vacuum gauge indicates 2000 microns Hg vacuum. Close the manifold hand valves and turn off pump.

4. Open the refrigerant cylinder liquid valve and reclaimer valve (if connected through the reclaimer) to break the vacuum. Raise the pressure approximately 2 psig. This will dislodge any remaining water in the system for the second evacuation. Close the cylinder valve.

5. Repeat steps 4 and 5.

6. Evacuate again to 500 microns Hg vacuum (steps 4 & 5).

7. Backseat the service valves (O5G only). Disconnect all hose from the unit.

8. Charge the system as outlined in the following section 4.8 (Adding Refrigerant To The System).

**b. Evacuation Procedure #2**

1. Follow steps 1 through 3 in procedure #1.

2. Start vacuum pump. Slowly open manifold valve and evacuate the system until the vacuum gauge indicates 500 microns Hg vacuum. Close the manifold hand valves and turn off pump.

3. Backseat the service valves (O5G only). Disconnect all hose from the unit.

4. Charge the system as outlined in the following section 4.8 (Adding Refrigerant To The System).

## 4.8 ADDING REFRIGERANT TO SYSTEM

### 4.8.1 Adding A Full Charge

a. Evacuate and dehydrate system as outlined in section 4.7. With a vacuum still in the unit, most of the refrigerant charge can be put in the through the reclaimer.

b. If the refrigerant cylinder is not connected to a reclaimer, place cylinder on a scale and connect charging hose from the cylinder to discharge service valve (O5G) or port (Sankyo). Purge charging line.

c. Note weight of refrigerant cylinder.

d. Open liquid valve on refrigerant container. Midseat discharge service valve (O5G only) and allow the appropriate charge amount (refer to section 1.2.a) to flow into the unit. The entire refrigerant charge may not flow into the system if the refrigerant cylinder and the system pressure equalize.

e. Shut off liquid valve on refrigerant cylinder and remove charging hose from the discharge valve/port. Connect hose to suction valve/port.

f. Start the unit and allow to stabilize (approximately 10 minutes). Bus interior temperature must be above set point of the temperature controller (65_F ¦ 3_F).

g. With the unit running, open the vapor valve of the refrigerant cylinder until the remainder of the charge has entered the system, note the weight of the cylinder.

h. Observe the moisture/liquid indicator (sight glass) to see if the bubbles clear. The indicator is located in the evaporator section as shown in figure 1–2.

### 4.8.2 Adding A Partial Charge

a. Connect charging hose from the reclaimer or refrigerant cylinder to suction service valve (O5G), or port (Sankyo). Service valve must be backseated when connecting hose. Purge charging line.

b. Start the unit and allow to stabilize (approximately 10 minutes). Bus interior temperature must be above set point of the temperature controller (65_F ¦ 3_F).

c. With the unit running, open the vapor valve of the refrigerant cylinder and midseat the suction service valve (on the O5G compressor).

d. Observe the bubbles in the moisture/liquid indicator (sight glass). Charge the unit until sight glass becomes clear. At this point, immediately shut the vapor valve of the refrigerant cylinder. The indicator is located in the evaporator section as shown in figure 1–2.

## 4.9 SANKYO COMPRESSOR MAINTENANCE

It is not necessary to check the oil level as routing maintenance. however, if a system component has been replaced, an obvious leak or there is good reason to suspect an incorrect oil level, made necessary repairs as outlined in the manufactures procedure.

## 4.10 O5G COMPRESSOR MAINTENANCE

### 4.10.1 Removing the compressor

If compressor is inoperative and unit still has refrigerant pressure, frontseat suction and discharge service valves to trap most of the refrigerant in the unit.

If compressor runs, pump down the unit. (Refer to paragraph 4.2.a.)

a. Slowly release compressor pressure.

b. Remove bolts from suction and discharge service valve flanges.

c. Disconnect wiring to unloader valve assemblies to the high and low pressure cutout switches if equipped and the clutch. Identify wiring and switches if necessary.

d. Attach sling or other device to the compressor and remove compressor from the bus.

e. Remove the three socket head cap screws from both cylinder heads that have the unloader valve on 05G compressor. Remove the unloader valve and bypass piston assembly, keeping the same capscrews with the assembly. The original unloader valve must be transferred to the replacement compressor. The plug arrangement removed from the replacement is installed in the original compressor as a seal. If piston is stuck, it may be extracted by threading socket head capscrew into top of piston. A small teflon seat ring at bottom of piston must be removed.

**NOTES**

1. The service replacement 05G compressor is sold without shutoff valves (but with valve pads). The optional unloaders are not supplied as the cylinder heads are shipped with plugs. Customer should retain the original unloader valves for use on replacement compressor.

2. The piston plug that is removed from the replacement compressor head must be installed in the failed compressor if returning for warranty.

3. Do not interchange allen head cap screws that mount the piston plug and unloader, they are not interchangeable.

4. Check oil level in service replacement compressor. Refer to section 1.2 and 4.10.2.

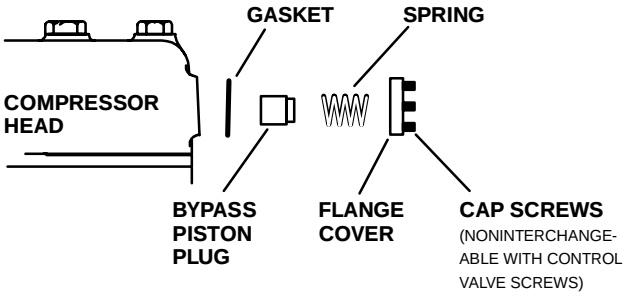



**Figure 4–5. Removing Bypass Piston Plug**

f. Remove the high and low pressure switch assembly and install on new compressor after checking switch setting.

g. Install compressor in unit by reversing steps b. through g. It is recommended using new locknuts when replacing compressor. Install new gaskets on service valves and tighten bolts uniformly.

h. Attach two lines (with hand valves near vacuum pump) to the suction and discharge service valves. (Dehydrate and evacuate compressor to 500 microns (29.90" Hg vacuum = 75.9 cm Hg vacuum). Turn off valves on both lines to pump.

i. Fully backseat (open) both suction and discharge service valves.

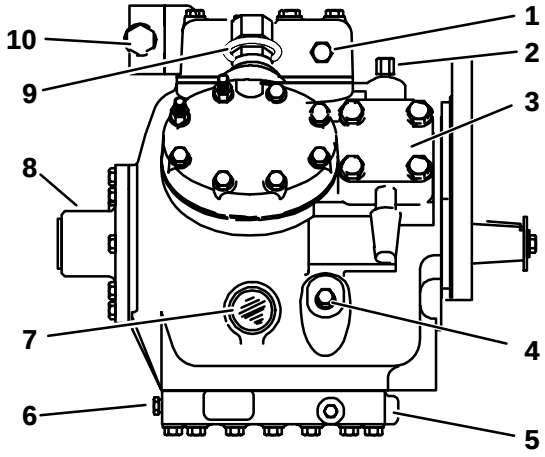
j. Remove vacuum pump lines and install manifold gauges.

k. Start unit and check refrigerant level.

l. Check compressor oil level. (Refer to section 4.9.) Add oil if necessary.

m. Check compressor unloader operation.

n. Check moisture–liquid indicator for moisture. Change filter–drier if necessary.




1. High Pressure Switch Connection
2. Low Pressure Switch Connection
3. Suction Service Valve
4. Oil Fill Plug
5. Bottom Plate
6. Oil Drain Plug
7. Oil Sight Glass
8. Oil Pump
9. Unloader Solenoid
10. Discharge Service Valve

**Figure 4–6. O5G Compressor**

### 4.10.2 Compressor Oil Level

#### a. Checking the Compressor Oil Level

1. Start the unit and allow the system to stabilize.

2. Check the oil sight glass on the compressor to ensure that no foaming of the oil is present after 20 minutes of operation. If the oil is foaming excessively after 20 minutes of operation, check the refrigerant system for flood–back of liquid refrigerant. Correct this situation before proceeding.

3. Check the level of the oil in the front sight glass with the compressor operating. the correct level should be between 1/4 and 1/2 of the sight glass. If the level is above 1/2, oil must be removed from the compressor. To remove oil from the compressor, follow step d. If the level is below 1/8, add oil to the compressor following step b.

#### b. Adding Oil with Compressor in System

Two methods for adding oil are the oil pump method and closed system method.

**1. Oil Pump Method**

One compressor oil pump that may be purchased is a Robinair part no. 14388. This oil pump adapts to a one

U.S. gallon (3.785 litres) metal refrigeration oil container and pumps 2−1/2 ounces (0.0725 litres) per stroke when connected to the suction service valve port. Also there is no need to remove pump from can after each use.

When the compressor is in operation, the pump check valve prevents the loss of refrigerant, while allowing servicemen to develop sufficient pressure to overcome the operating suction pressure to add oil as necessary.

Backseat suction service valve and connect oil charging hose to port. Crack the service valve and purge the oil hose at oil pump. Add oil as necessary.

**2. Closed System Method**

In an emergency where an oil pump is not available, oil may be drawn into the compressor through the suction service valve.

**CAUTION**

**Extreme care must be taken to ensure the manifold common connection remains immersed in oil at all times. Otherwise air and moisture will be drawn into the compressor.**

Connect the suction connection of the gauge manifold to the compressor suction service valve port, and immerse the common connection of the gauge manifold in an open container of refrigeration oil. Crack the suction service valve and gauge valve to vent a small amount of refrigerant through the common connection and the oil to purge the lines of air. Close the gauge manifold valve.

With the unit running, frontseat the suction service valve and pull a vacuum in the compressor crankcase. **SLOWLY** crack the suction gauge manifold valve and oil will flow through the suction service valve into the compressor. Add oil as necessary.

**c. Adding Oil to Service Replacement Compressor**

**NOTE**

For correct oil charge refer to paragraph 1.2.a. Service replacement compressors may or may not be shipped with oil.

**If compressor is without oil:**

Add oil, through the suction service valve flange cavity or by removing the oil fill plug (see Figure 4−6).

**d. To Remove Oil from the Compressor:**

1. If the oil level recorded in step a.3 above is at 3/4 of the sight glass, remove 1−1/2 pints of oil from the compressor. If at a full sight glass, remove 2−3/4 pints of oil from the compressor.

2. Close suction service valve (frontseat) and pump unit down to 3 to 5 psig . Frontseat discharge service valve and slowly bleed remaining refrigerant.

3. Remove the oil drain plug on the bottom plate of the compressor and drain the proper amount of oil from the compressor. Replace the plug securely back into the compressor.

4. Repeat step 1 to ensure proper oil level.

**4.10.3 Checking and Servicing the Compressor Unloaders**

**a. Checking Compressor Unloader Operation**

**NOTE**

The controller prevents the compressor unloaders from energizing when bus temperature is below set point (65_F ¦ 3_F).

1. Remove wiring from the front unloader coil. Place electrical tape over wire terminals.

2. Remove one or more of the four condenser fan relays (R9, R10, R11, and R12) to stop the condenser fans which will raise the discharge pressure in the system which will close the high pressure unloader control switch (HC). The closed HC switch will then allow the unloader coil to energize and unload. Note suction pressure, a rise of approximately 4 psig (.3 kg/cm@) will be noted on the suction pressure gauge.

3. Compressor is now fully unloaded and only the top bank is loaded (two cylinders).

4. Reverse the above procedure to check out compressor loading. Suction pressure will drop with this test.

**NOTE**

If unloader coils energize but the suction pressure does not change, the unloader piston valve did not retract and must be checked.

**b. Servicing the Compressor Unloader Valve − Alco**

**1. Coil Replacement**

**NOTE**

The coil may be removed without pumping the unit down.

a. Disconnect leads. Lift off coil.

b. Verify coil type, voltage and frequency of old and new coil. This information appears on the coil housing.

**2. Replacing Solenoid Valve Internal Parts**

a. Pump down the unit. (Refer to section 4.4.) Frontseat both service valves to isolate the compressor.

b. Remove snap cap and unloader coil.

c. Remove enclosing tube collar (item 4) using nut supplied (item 3, Figure 4−7).

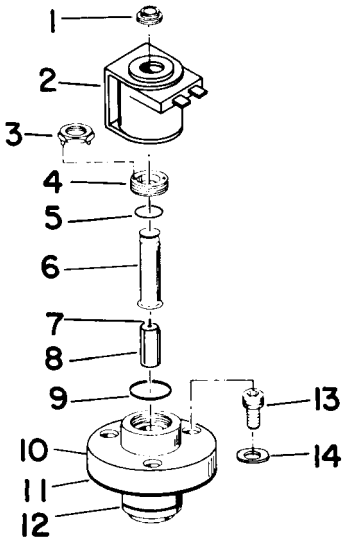
d. Check plunger for restriction due to: (a) Corroded or worn parts; (b) Foreign material lodged in valve; (c) Bent or dented enclosing tube.

e. Install new parts. Do not overtighten enclosing tube assembly. Torque to a value of 100 inch pounds (1.15 mkg).

f. Remove supplied enclosing tube collar. Install coil, and snap cap.

g. Evacuate and dehydrate the compressor.

h. Start unit and check unloader operation.




1. Snap Cap
2. Coil Assembly
3. Nut
4. Enclosing Tube Collar
5. "O" Ring
6. Enclosing Tube
7. Plunger Spring
8. Plunger Assembly
9. Gasket
10. Valve Body
11. Gasket
12. Piston Ring
13. Capscrew
14. Capscrew Gasket

**Figure 4–7. Unloader Solenoid Valve**

**3. Solenoid Operates but Unloader Valve Malfunctions**

a. Pump the unit down and isolate the compressor by frontseating both the suction and discharge service valves.

b. Remove the coil from the unloader valve.

c. Remove three socket head cap screws and remove control valve assembly.

d. Install new unloader valve assembly and replace coil removed in step 2.

e. Dehydrate and evacuate the compressor.

f. Check unloader operation.

## 4.11 CHECKING AND REPLACING THE LOW AND HIGH PRESSURE CUTOUT SWITCH

### 4.11.1 Checking Low Pressure Switch

The low pressure switch is located on the suction line in the evaporator section of the Capri–180 and Capri–280 Advantage Wide model. On Capri–280 Advantage model, the switch is located on the compressor low pressure connection. With 180 models, each system should be tested when checking the switch.

a. Attach manifold gauge set to compressor. The connection can be made at the high side port located in the evaporator section (see Figure 1–1) of the 280AW model.

a. Start unit and run for 10 minutes.

b. Slowly close receiver service valve (180 models) or the compressor suction service valve (280 models). As the suction pressure decrease, the switch should cutout when the suction gauge reads 4 ¦ 3 psig to stop the compressor clutch and evaporator motors if working properly.

c. Open receiver service valve. As the pressure increase to a gauge reading of 25 ¦ 3 psig (switch cut–in setting), the compressor clutch and evaporator motor should engage if working properly.

d. If the switch does not perform as outlined above, check for defective wiring before replacing. To replace, pump down the unit and remove the switch from the threaded schrader fitting.

### 4.11.2 Checking High Pressure Switch

On Capri–180 units, the high pressure switches are located on the discharge lines in the evaporator section (Each system should be tested when checking the switch.). On Capri–280 Advantage Wide units, the switch is located on the hot gas line entering the condenser coils. On Capri–280 Advantage units, the switch is located on the compressor center head high pressure connection.

a. Attach manifold gauge set to compressor. On 280AW models, the connection can be made at the high side port located in the evaporator section (see Figure 1–1).

b. Start unit and run for 10 minutes.

c. Block the condenser with cardboard or disconnect the fans to reduce air flow across the condenser and increase pressure. Observe the discharge pressure gage.

d. When the gauge reading reaches 410 ¦ 10 psig (switch cutout setting), the compressor clutch will disengage and the evaporator motor will stop if working properly. If this does not occur, turn the A/C switch or vehicle engine off to prevent damage to the compressor.

e. Remove cardboard from condenser or reconnect fans (with the unit off) to reduce the system pressure; the switch should close at 300 ¦ 10 psig if working properly to engage the compressor clutch.

f. If the switch does not perform as outlined above, check for defective wiring before replacing. On 280 Advantage units (switch located on the compressor) pump down the compressor and replace. On 180 and 280 Wide units (switch located on the high side refrigerant line) remove entire charge and replace switch from threaded fitting.

## 4.12 MOISTURE–LIQUID INDICATOR

When the refrigeration system is operating, the moisture–liquid indicator provides an indication of moisture in the system.

The indicator element is highly sensitive to moisture and will gradually change color in direct relation to an increase or decrease in the moisture content of the system. The safe, caution, and unsafe system operating conditions are then easily determined by matching the element color with the colors displayed on the reference label.

The filter−drier should always replaced when changing the moisture−liquid indicator.

**a. To Change Indicator Or Lens**

1. Pump down the unit per section 4.3 to isolate filter−drier and sight glass. Frontseat (close) the suction service valve and receiver outlet valve.

2. Install new indicator or lens and filter−drier. Leave one connection of filter−drier loose. Open the suction service and receiver valves slowly to purge line. Tighten fitting.

3. After approximately twelve hours of operation, check indicator. If indicator does not indicate a dry condition, check for leaks and evacuate and dehydrate the system as outlined in section 4.7. Repeat procedure 4.12.a. again.

## 4.13 FILTER−DRIER

If the sight glass appears to be flashing or excessive bubbles are constantly moving through the sight glass, the unit may have a low refrigerant charge, or the filter−drier could be partially plugged.

Check for a restricted or plugged filter−drier by feeling the liquid line inlet and outlet connections of the drier cartridge. If the outlet side feels cooler than the inlet side, then the filter−drier should be changed. Also the moisture−indicator may show an abnormal (wet) condition.

**a. To Change the Filter−Drier**

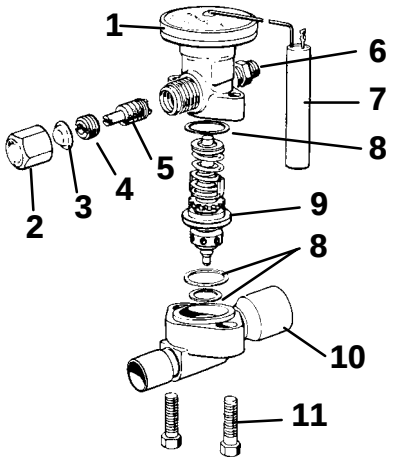
1. To replace, isolate the filter−drier by frontseating (closing) the filter−drier outlet valve and receiver outlet valve. Some Capri−280 models are equipped with an additional valve at the inlet of the filter−drier, in which case the drier can be isolated at this point.

2. Loosen the filter−drier connections and remove the drier. Install new drier by leaving the outlet connection loose. Open the receiver outlet valve (or inlet valve if so equipped) slowly to purge the new filter−drier through the loose connection; then tighten.

3. Start the unit and check for leaks.

## 4.14 THERMOSTATIC EXPANSION VALVE

The thermal expansion valve is an automatic device which maintains constant superheat of the refrigerant gas leaving the evaporator regardless of suction pressure. The valve functions are: (a) automatic response of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant entering the compressor. Unless the valve is defective, it seldom requires any maintenance.




1. Power Head
2. Cap Seal
3. Flare Seal
4. Retaining Nut
5. Adjusting Stem
6. Equalizer Connection
7. Bulb
8 Gasket
9. Cage Assembly
10. Body Flange
11. Capscrew

**Figure 4−8. Thermostatic Expansion Valve**

**a. Replacing the Expansion Valve.**

1. Pump down the unit. (Refer to section 4.3.)

2. Remove insulation (Presstite) from expansion valve bulb and then remove bulb from suction line.

3. Loosen flare nut and disconnect equalizer line from expansion valve.

4. Remove flange screws and lift off power assembly. Then remove the cage assembly. Check for foreign material in valve body.

5. The thermal bulb is located below the center of the suction line (4 or 7 o'clock position). This area must be clean to ensure positive bulb contact. Strap thermal bulb to suction line and insulate both with "Presstite."

6. Install new gaskets and insert cage assembly and install power assembly.

7. Fasten equalizer tube to expansion valve.

8. Evacuate by placing vacuum pump on suction service valve.

9. Open receiver outlet valve and then check refrigerant level.

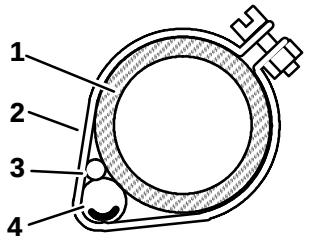
10. Check superheat.

**b. To Measure Superheat**

1. Remove Presstite from expansion valve bulb and suction line.

2. Loosen one TXV bulb clamp and make sure area under clamp (between TXV bulb and line) is clean.

3. Place temperature thermocouple on top of the TXV bulb (parallel) (see Figure 4−9) and secure loosened clamp making sure both bulbs are firmly secured to suction line. Replace Presstite around bulb.




1. Suction Line (end view)
2. TXV Bulb Clamp
3. Thermocouple
4. TXV Bulb

**Figure 4–9. Thermocouple Location**

4. Connect an accurate gauge to the 1/4" port on the suction service valve.

5. Run unit until unit has stabilized.

**NOTES**

1. *Capri–180:* When conducting this test the suction pressure must be at least 6 psig (.42 kg/cm@) below expansion valve maximum operating pressure (MOP). *For example:* the 180 models using refrigerant R–12 have an expansion valve with a 55 MOP. *The recommended test pressure should be* below 49 psig (3.4 kg/cm@).

2. *Capri–280:* When conducting this test the suction pressure must be at least 6 psig (.42 kg/cm@) below expansion valve maximum operating pressure (MOP). *For example:* the 280 models using refrigerant R–22 have an expansion valve with a 100 MOP. *The recommended test pressure should be* below 94 psig (3.4 kg/cm@).

6. From the applicable temperature/pressure chart (table 4–1 or 4–2) determine the saturation temperature corresponding to the evaporator outlet pressure. Add an estimated suction line loss of 2 psig (.14 kg/cm@) to the figure.

7. Note the temperature of the suction gas at the expansion valve bulb. Subtract the saturation temperature determined in Step 6 from the average temperature measured in Step 7. The difference is the superheat of the suction gas.

**c. Adjusting Superheat**

The recommended superheat setting is 10_ to 12_F.

1. Remove hex cap from side of TXV power head. This will expose the adjusting stem which has a screw slot.

2. With a screwdriver, turn the adjusting stem clockwise to increase superheat; turn counterclockwise to reduce superheat. Approximately 2 turns of the adjusting stem will change super heat 1_F. Make adjustment slowly to give the valve a chance to equalize at new setting.

3. Replace cap and check operation of unit.

**Table 4--1. R--22 Temperature--Pressure Chart**

*(Numbers rounded to next highest)*

| TEMPERATURE | | PRESSURE | | | TEMPERATURE | | PRESSURE | | |
|---|---|---|---|---|---|---|---|---|---|
| _F | _C | Psig | Kg/cm@ | Bar | _F | _C | Psig | Kg/cm@ | Bar |
| −40 | −40 | .6 | .04 | .04 | 34 | 1 | 60.5 | 4.25 | 4.17 |
| −36 | −38 | 2.3 | .16 | .16 | 36 | 2 | 63.3 | 4.45 | 4.36 |
| −32 | −36 | 4.1 | .29 | .28 | 38 | 3 | 66.1 | 4.65 | 4.56 |
| −28 | −33 | 6 | .42 | .41 | 40 | 4 | 69 | 4.85 | 4.76 |
| −26 | −32 | 7 | .49 | .48 | 44 | 7 | 75.0 | 5.27 | 5.17 |
| −24 | −31 | 8.1 | .57 | .56 | 48 | 9 | 81.4 | 5.72 | 5.61 |
| −22 | −30 | 9.2 | .65 | .63 | 52 | 11 | 88.1 | 6.19 | 6.07 |
| −20 | −29 | 10.3 | .72 | .71 | 54 | 12 | 91.5 | 6.43 | 6.31 |
| −18 | −28 | 11.5 | .81 | .79 | 60 | 16 | 102.5 | 7.21 | 7.07 |
| −16 | −27 | 12.7 | .89 | .88 | 64 | 18 | 110.2 | 7.75 | 7.6 |
| −14 | −26 | 14 | .98 | .97 | 68 | 20 | 118.3 | 8.32 | 8.16 |
| −12 | −24 | 15.2 | 1.07 | 1.05 | 72 | 22 | 126.8 | 8.91 | 8.74 |
| −10 | −23 | 16.6 | 1.17 | 1.14 | 76 | 24 | 135.7 | 9.54 | 9.36 |
| − 8 | −22 | 18 | 1.27 | 1.24 | 80 | 27 | 145 | 10.19 | 10 |
| − 6 | −21 | 19.4 | 1.36 | 1.34 | 84 | 29 | 154.7 | 10.88 | 10.67 |
| − 4 | −20 | 21 | 1.48 | 1.45 | 88 | 31 | 164.9 | 11.59 | 11.37 |
| − 2 | −19 | 22.5 | 1.58 | 1.55 | 92 | 33 | 175.4 | 12.33 | 12.09 |
| 0 | −18 | 24.1 | 1.69 | 1.66 | 96 | 36 | 186.5 | 13.11 | 12.86 |
| 2 | −17 | 25.7 | 1.81 | 1.77 | 100 | 38 | 197.9 | 13.91 | 13.64 |
| 4 | −16 | 27.4 | 1.93 | 1.89 | 104 | 40 | 209.9 | 14.76 | 14.47 |
| 6 | −14 | 29.2 | 2.05 | 2.01 | 108 | 42 | 222.3 | 15.63 | 15.33 |
| 8 | −13 | 31 | 2.18 | 2.14 | 112 | 44 | 235.2 | 16.54 | 16.22 |
| 10 | −12 | 32.9 | 2.31 | 2.27 | 116 | 47 | 248.7 | 17.49 | 17.15 |
| 12 | −11 | 34.9 | 2.45 | 2.41 | 120 | 49 | 262.6 | 18.46 | 18.11 |
| 14 | −10 | 36.9 | 2.59 | 2.54 | 124 | 51 | 277.0 | 19.48 | 19.10 |
| 16 | − 9 | 39 | 2.74 | 2.69 | 128 | 53 | 291.8 | 20.52 | 20.12 |
| 18 | − 8 | 41.1 | 2.89 | 2.83 | 132 | 56 | 307.1 | 21.59 | 21.17 |
| 20 | − 7 | 43.3 | 3.04 | 2.99 | 136 | 58 | 323.6 | 22.75 | 22.31 |
| 22 | − 6 | 45.5 | 3.2 | 3.14 | 140 | 60 | 341.3 | 24 | 23.53 |
| 24 | − 4 | 47.9 | 3.37 | 3.3 | 144 | 62 | 359.4 | 25.27 | 24.78 |
| 26 | − 3 | 50.2 | 3.53 | 3.46 | 148 | 64 | 377.9 | 26.57 | 26.06 |
| 28 | − 2 | 52.7 | 3.71 | 3.63 | 152 | 67 | 396.6 | 27.88 | 27.34 |
| 30 | − 1 | 55.2 | 3.88 | 3.81 | 156 | 69 | 415.6 | 29.22 | 28.65 |
| 32 | 0 | 57.8 | 4.06 | 3.99 | 160 | 71 | 434.6 | 30.56 | 29.96 |

**Table 4–2. R–12 Temperature–Pressure Chart**

**BOLD FIGURES** = Inches Mercury Vacuum (cm Hg Vac)
LIGHT FIGURES = psig (kg/cm@)

*(Numbers rounded to next highest)*

| TEMPERATURE | | PRESSURE | | | TEMPERATURE | | PRESSURE | | |
|---|---|---|---|---|---|---|---|---|---|
| _F | _C | Psig | Kg/cm@ | Bar | _F | _C | Psig | Kg/cm@ | Bar |
| –40 | –40 | **11.0** | **27.9** | .37 | 28 | – 2 | 26.9 | 1.89 | 1.85 |
| –35 | –37 | **8.4** | **21.3** | .28 | 30 | – 1 | 28.5 | 2.00 | 1.97 |
| –30 | –34 | **5.5** | **14.0** | .19 | 32 | 0 | 30.1 | 2.12 | 2.08 |
| –28 | –33 | **4.3** | **10.9** | .15 | 34 | 1 | 31.7 | 2.23 | 2.19 |
| –26 | –32 | **3.0** | **7.6** | .10 | 36 | 2 | 33.4 | 2.35 | 2.30 |
| –24 | –31 | **1.6** | **4.1** | .05 | 38 | 3 | 35.2 | 2.47 | 2.43 |
| –22 | –30 | **0.3** | **0.8** | .01 | 40 | 4 | 37.0 | 2.60 | 2.55 |
| –20 | –29 | 0.5 | .04 | .03 | 45 | 7 | 41.7 | 2.93 | 2.88 |
| –18 | –28 | 1.3 | .09 | .09 | 50 | 10 | 46.7 | 3.28 | 3.22 |
| –16 | –27 | 2.1 | .15 | .14 | 55 | 13 | 52.0 | 3.66 | 3.59 |
| –14 | –26 | 2.8 | .20 | .19 | 60 | 16 | 57.7 | 4.06 | 3.98 |
| –12 | –24 | 3.7 | .26 | .26 | 65 | 18 | 63.8 | 4.49 | 4.40 |
| –10 | –23 | 4.5 | . 32 | .31 | 70 | 21 | 70.2 | 4.94 | 4.84 |
| – 8 | –22 | 5.4 | .38 | .37 | 75 | 24 | 77.0 | 5.41 | 5.31 |
| – 6 | –21 | 6.3 | .44 | .43 | 80 | 27 | 84.2 | 5.92 | 5.81 |
| – 4 | –20 | 7.2 | .51 | .50 | 85 | 29 | 91.8 | 6.45 | 6.33 |
| – 2 | –19 | 8.2 | .58 | .57 | 90 | 32 | 99.8 | 7.02 | 6.88 |
| 0 | –18 | 9.2 | .65 | .63 | 95 | 35 | 108.2 | 7.61 | 7.42 |
| 2 | –17 | 10.2 | .72 | .70 | 100 | 38 | 117.2 | 8.24 | 8.08 |
| 4 | –16 | 11.2 | .79 | .77 | 105 | 41 | 126.6 | 8.90 | 8.73 |
| 6 | –14 | 12.3 | .86 | .85 | 110 | 43 | 136.4 | 9.59 | 9.40 |
| 8 | –13 | 13.5 | .95 | .93 | 115 | 46 | 146.8 | 10.32 | 10.12 |
| 10 | –12 | 14.6 | 1.03 | 1.01 | 120 | 49 | 157.6 | 11.08 | 10.87 |
| 12 | –11 | 15.8 | 1.11 | 1.09 | 125 | 52 | 169.1 | 11.89 | 11.66 |
| 14 | –10 | 17.1 | 1.20 | 1.18 | 130 | 54 | 181.0 | 12.73 | 12.48 |
| 16 | – 9 | 18.4 | 1.29 | 1.27 | 135 | 57 | 193.5 | 13.60 | 13.34 |
| 18 | – 8 | 19.7 | 1.39 | 1.36 | 140 | 60 | 206.6 | 14.53 | 14.24 |
| 20 | – 7 | 21.0 | 1.48 | 1.45 | 145 | 63 | 220.3 | 15.49 | 15.19 |
| 22 | – 6 | 22.4 | 1.57 | 1.54 | 150 | 66 | 234.6 | 16.49 | 16.18 |
| 24 | – 4 | 23.9 | 1.68 | 1.65 | 155 | 68 | 249.5 | 17.54 | 17.20 |
| 26 | – 3 | 25.4 | 1.79 | 1.75 | 160 | 71 | 265.1 | 18.64 | 18.28 |

# SECTION 5

# ELECTRICAL SCHEMATICS

## 5.1 INTRODUCTION

This section includes wiring schematics for the Capri−180 and Capri−280A & AW units with both the Black and Green relay control board applications.

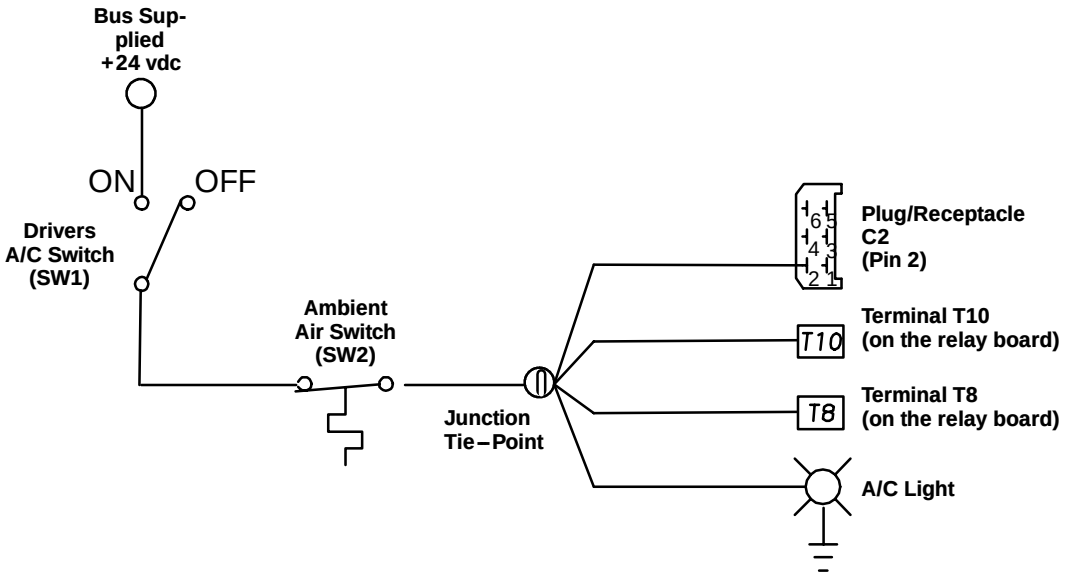
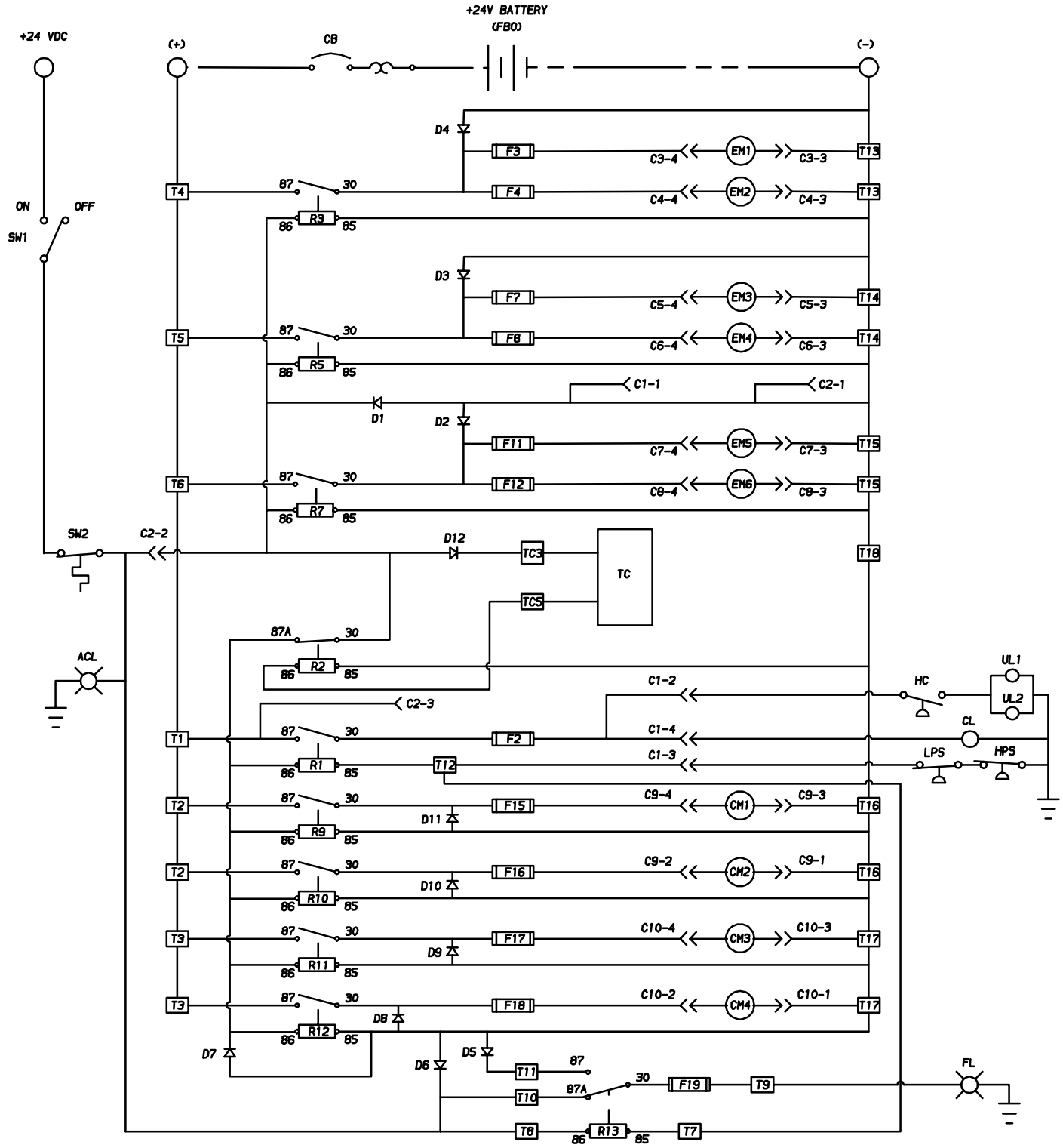
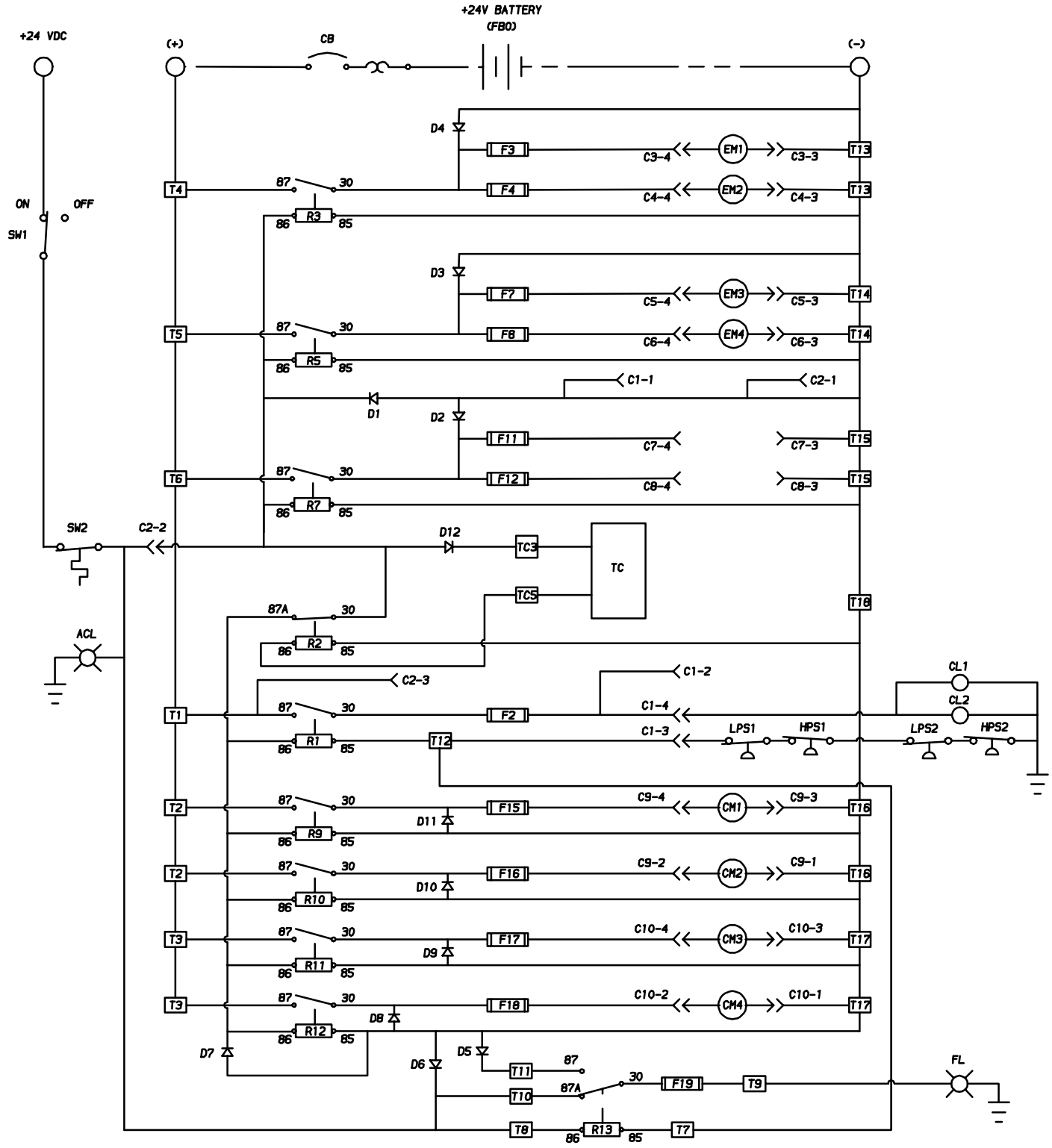



**Figure 5−1. Starting Circuit Wiring to the Green Relay Control Board**




| | | | | | |
|---|---|---|---|---|---|
| **ACL** | A/C Light | **F2,F3,F4,F7** | | **R2** | Relay – Temperature Control |
| **C1** | Socket/Receptacle | **F8,F11, F12** | | **R3,R5,R7** | Relay – Evap. Blower Motor |
| **C2** | Socket/Receptacle | **& F19** | Fuses – 15 amp | **R9–R12** | Relay – Cond. Fan Motor |
| **C3–C8** | Socket/Receptacle | **FL** | Fault Light | **R13** | Relay – Fault |
| **C9,C10** | Socket/Receptacle | **HC** | Switch – Unloader Control | **SW1** | Switch – A/C On/Off |
| **CB** | Circuit Breaker – 150 amp | | (High Pressure Control) | **SW2** | Switch – Ambient Air |
| **CL** | Compressor Clutch Coil | **HPS** | Switch – High Pressure | **TC** | Temperature Controller |
| **CM1–CM4** | Motor – Condenser Fan | **LPS** | Switch – Low Pressure | **UL1 & 2** | Compressor Unloader Coils |
| **EM1–EM6** | Motor – Evaporator Blower | **R1** | Relay – Clutch | **(FBO)** | Furnished By Others |
| **F15 – F18** | Fuses – 20 amp | | | | |

**Figure 5–2. Capri–280 Electrical Wiring Schematic with Green Relay Control Boards**




| | | | | | |
|---|---|---|---|---|---|
| **ACL** | A/C Light | **F15 – F18** | Fuses – 20 amp | **R3 & R5** | Relay – Evap. Blower Motor |
| **C1** | Socket/Receptacle | **F2,F3,F4,F7** | | **R7** | Relay, Spare |
| **C2** | Socket/Receptacle | **F8 & F13** | Fuses – 15 amp | **R9 – R12** | Relay – Cond. Fan Motor |
| **C3–C8** | Socket/Receptacle | **F11 & F12** | Fuses, Spares (15 amp) | **R13** | Relay – Fault |
| **C9,C10** | Socket/Receptacle | **FL** | Fault Light | **SW1** | Switch – A/C On/Off |
| **CB** | Circuit Breaker – 150 amp | **HPS1 & 2** | Switch – High Pressure | **SW2** | Switch – Ambient Air |
| **CL1 & 2** | Compressor Clutch Coil | **LPS1 & 2** | Switch – Low Pressure | **TC** | Temperature Controller |
| **CM1–CM4** | Motor – Condenser Fan | **R1** | Relay – Clutch | **FBO)** | Furnished By Others |
| **EM1–EM4** | Motor – Evaporator Blower | **R2** | Relay – Temperature Control | | |

**Figure 5–3. Capri–180 Electrical Wiring Schematic with Green Relay Control Boards**